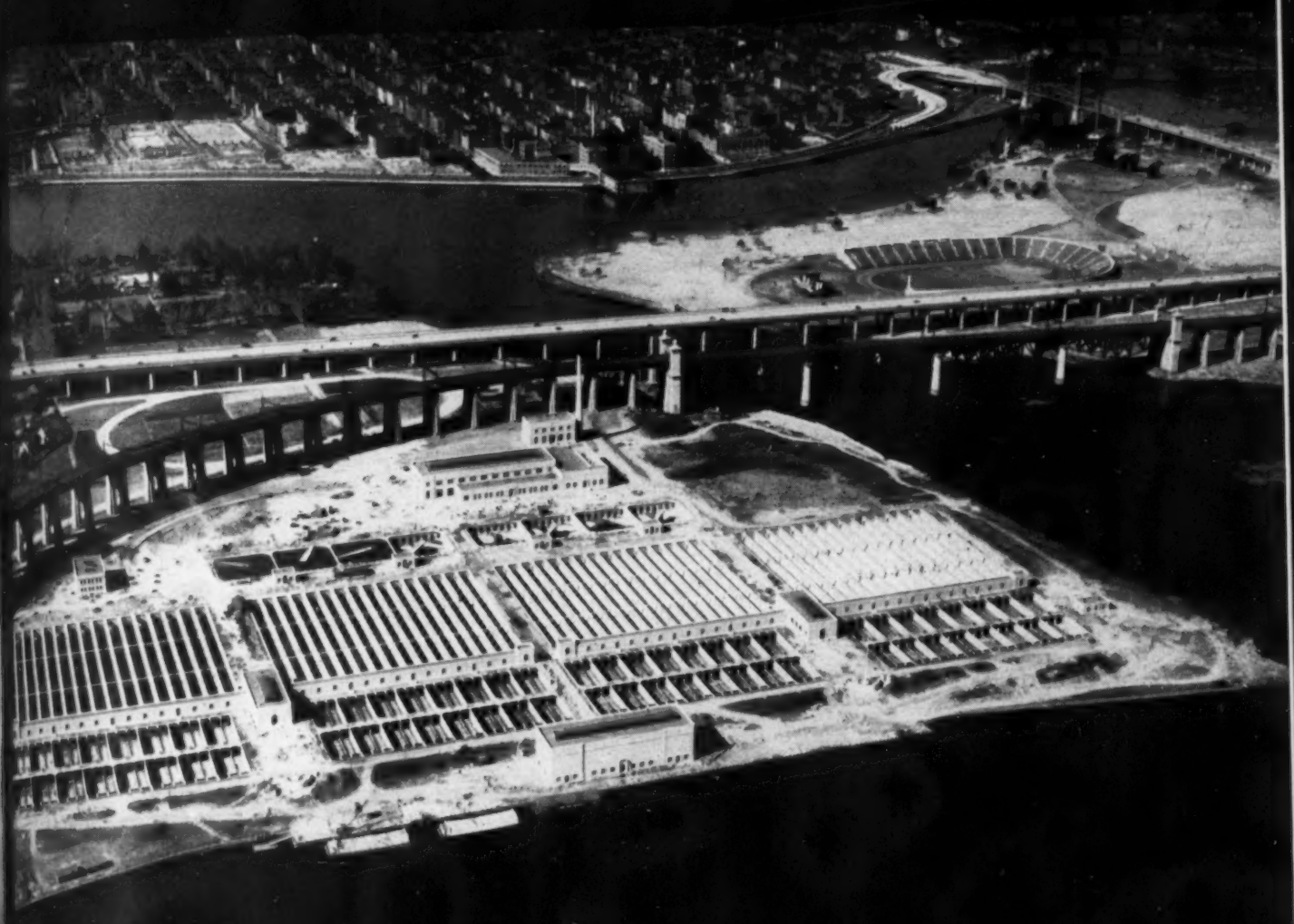
WATER WORKS & SEWERAGE



Ferric Chloride

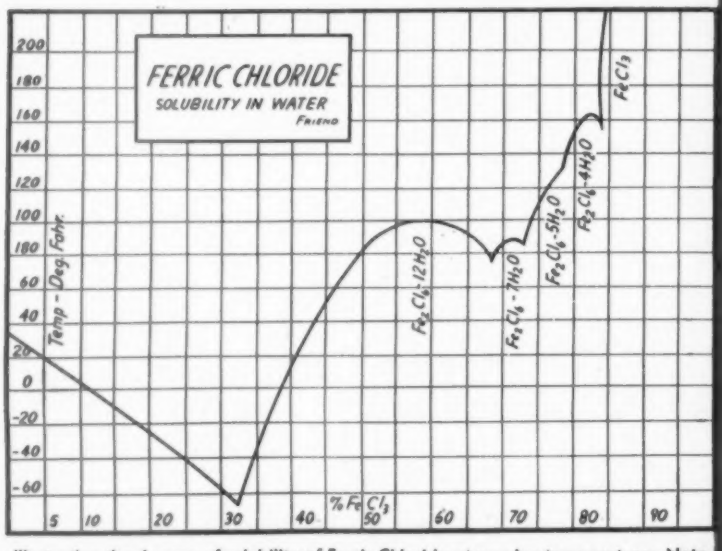
LIQUID AND ANHYDROUS

$FeCl_3$

an effective chemical coagulant for

SEWAGE TREATMENT

Photograph illustrates some of the "vacuum" filters used for filtering sewage sludge treated with Ferric Chloride and Lime at the City of Detroit Sewage Treatment Plant.



Illustrating the degree of solubility of Ferric Chloride at varying temperatures. Note that a 45 per cent solution will crystallize at about 52 degrees F.; a 33 per cent at zero.

In sewage treatment, Ferric Chloride is used as a chemical conditioning agent for the dewatering of fresh sludges, excess (waste) sludges, and digested sludges. It is a valuable aid in improving flocculent particles in biological sewage treatment processes.

Sewage Treatment Works all over the country are increasing the use of Ferric Chloride to solve their sewage problems. It has many possibilities as a chemical coagulant, some of which are yet to be explored.

We will gladly advise you on all chemical sewage treatment problems. For more information, write to us.

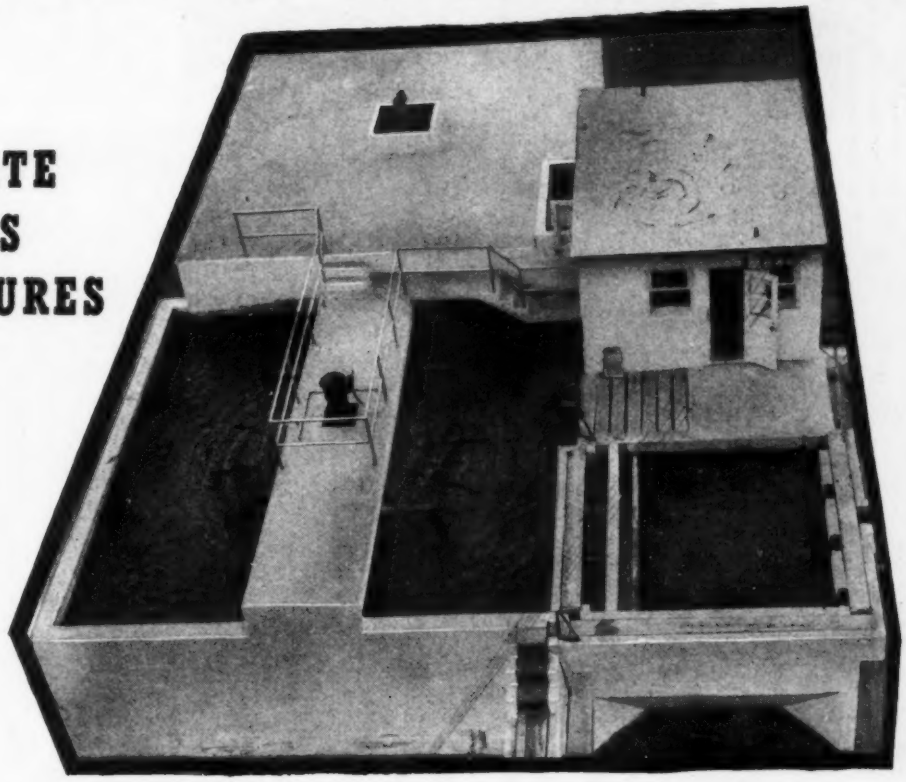
PENNSYLVANIA SALT
MANUFACTURING COMPANY
Chemicals

1000 WIDENER BUILDING, PHILADELPHIA 7, PA.
NEW YORK • CHICAGO • ST. LOUIS • PITTSBURGH • CINCINNATI
MINNEAPOLIS • WYANDOTTE • TACOMA

WATER WORKS & SEWERAGE, November, 1945. Volume 92, Number 11. Published monthly by Gillette Publishing Co., 330 South Wells Street, Chicago, Ill. Per copy, 25c. Subscription rate, United States, $2.00 per year; Canada, $2.00 per year; Foreign, $3.00 per year. Entered as Second Class Matter, June 2, 1931, at the Post Office at Chicago, Ill., under act of March 3, 1879.

CHICAGO "PACKAGE" SEWAGE PLANTS

SIMPLE TO OPERATE DUE TO INGENIOUS AUTOMATIC FEATURES



Chicago "Package" Sewage Treatment Plant at The Consolidated Vultee Aircraft Corp., Miami Springs, Florida. Design flow rate 90,000 G.P.D. for 3,000 population. The plant is composed of a primary tank, Combination Aerator-Clarifier, pump house and digester.

OVER 100 PLANTS PAST 10 YEARS CONSISTENT COMPLETE TREATMENT

Ingenious automatic features of Chicago "Package" sewage treatment plants simplify operation and assure successful performance. These features were developed during the past ten years, during which time more than 100 plants were put in successful operation.

Aeration and clarification are performed within a single tank with positive, automatic sludge control. Only one simple sludge control setting, which covers a wide range of varying sewage flows and strengths.

Local operators without previous sewage treatment experience are successfully operating these plants. Some were farmers; others were coal miners, laborers, plumbers, pipefitters, salesmen and school teachers. Some of these operators also perform other municipal duties. Operator training service by Chicago Pump Company Operating Sanitary Engineers goes with each plant.

Chicago "Package" plants are for small municipalities, airports, housing projects, institutions and industrial plants. The first cost is low. They require a minimum of operating supervision, produce a sparkling clear effluent, are free from flies, odors or unsightly appearances and may be safely located near dwellings.

Write for full description and discussion, facts and figures for this type of plant, which has been specifically developed for the characteristic small community sewage flow and strength.

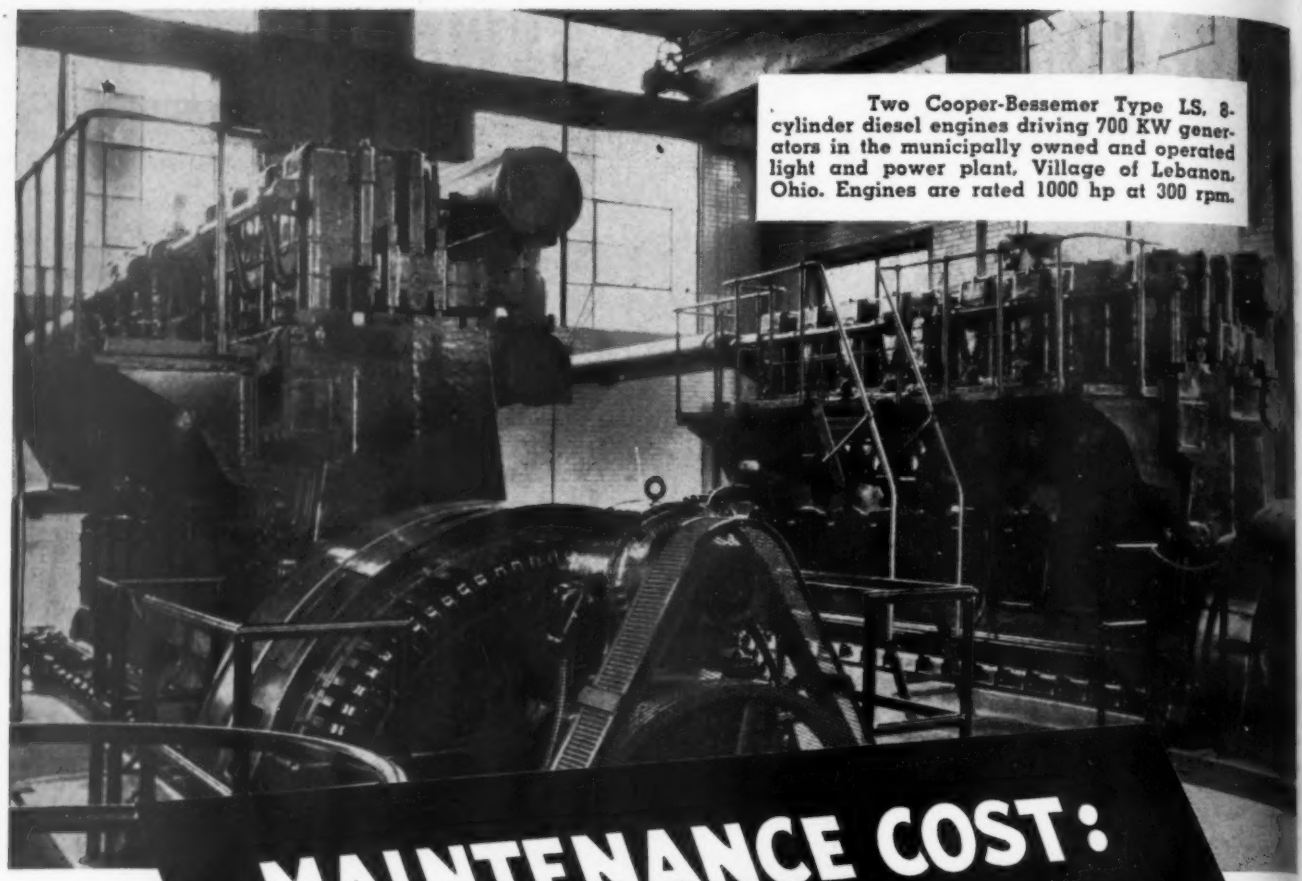
CHICAGO PUMP COMPANY

SEWAGE EQUIPMENT DIVISION

2349 WOLFRAM STREET — **CHICAGO 18, ILLINOIS**

Flush Kleen, Scru-Peller, Plunger, Horizontal and Vertical Non-Clogs, Water Seal Pumping Units, Samplers,

Swing Diffusers, Stationary Diffusers, Mechanical Aerators, Combination Aerator-Clarifiers, Comminutors.



Two Cooper-Bessemer Type LS, 8-cylinder diesel engines driving 700 KW generators in the municipally owned and operated light and power plant, Village of Lebanon, Ohio. Engines are rated 1000 hp at 300 rpm.

MAINTENANCE COST: less than 1% per year

THESE two Cooper-Bessemer diesels powering the Lebanon, Ohio, municipal power and light plant have been in continual service since November, 1941. Maintenance cost is averaging less than 1 percent of engine cost per year. Here is a typical example of the maintenance economy demonstrated time and again in Cooper-Bessemer installations.

How about operating economy and efficiency? Mr. L. F. Wertz, Lebanon's capable plant superintendent, says, "Our fuel bill runs less than ½ cent per KW generated. Last month lube oil consumption cost us only .015 cents per KW. Bonds issued to finance our new plant are being retired much faster than originally estimated due to the earnings made possible by the efficiency of our Cooper-Bessemer Diesels." Mr. Wertz might also tell you that power is delivered at a highly competitive rate and that village-consumed power, valued at $12,000 per year, is furnished free.

Modern, long-lived Cooper-Bessemer diesels are available in sizes and types for virtually all heavy-duty requirements, stationary or mobile. Contact the nearest Cooper-Bessemer office for complete details.

THE Cooper-Bessemer CORPORATION

Mt. Vernon, Ohio • Grove City, Pa.

New York, Washington, Gloucester, Dallas, Houston, St. Louis, Los Angeles, Seattle, San Francisco, and the Calmes Engineering Company, New Orleans, La.

BUILDERS OF DEPENDABLE ENGINES FOR 112 YEARS

Sustained ACCURACY—

to a Trickle—and to a Maximum Capacity Flow!

EVERY fractional cubic foot of water that flows through a Badger Water Meter is recorded faithfully — whether the unit be a large Badger Compound Meter or a ⅝-inch Badger Disc Meter.

Sustained sensitivity, accuracy, durability plus easy interchange of parts — these Badger features are priceless today — in maintaining accurate records of flow at lowest cost for maintenance.

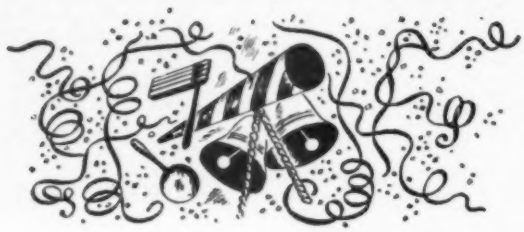
In your postwar planning, keep in mind the enviable record of Badger Water Meters for sustained accuracy and durability far beyond normal expectancy.

BADGER METER MANUFACTURING CO., MILWAUKEE, WIS.

Branch Offices in: New York City • Chicago, Ill. • Waco, Texas • Portland, Ore. • Salt Lake City, Utah
Seattle, Wash. • Cincinnati, Ohio • Kansas City, Mo. • Tampa, Fla. • Savannah, Ga.
Los Angeles, Cal. • Philadelphia, Pa. • Denver, Colo. • Worcester, Mass.

it's Post War now

For Mathieson's Sodium Chlorite and its Co-Product, Chlorine Dioxide



YES — through the ingenuity of Mathieson's chemical engineers, the available supply of Sodium Chlorite (and its amazingly useful co-product, Chlorine Dioxide) has been stepped-up to totals almost as great as originally planned for post war!

In simplest terms, this means that this most versatile — *under certain conditions most powerful and under other specific conditions most gentle* — oxidizing agent yet developed is available *now*. To many phases of American industry and to hundreds of communities beset with taste and odor problems in their water supply systems — this announcement will be of outstanding significance.

The adoption of Sodium Chlorite and Chlorine Dioxide in the technique of bleaching is certain to result in improved quality of many products now bleached by older methods. Textiles — cotton, rayon, and nylon . . . paper products of all kinds . . . edible and inedible oils . . . shellacs and varnishes . . . even beeswax and straw products, can be bleached *whiter* than ever before with an absolute minimum change of chemical and physical characteristics through the use of Sodium Chlorite. And Mathieson's research staff is still developing more and more uses for this greatest of oxidizing agents!

Mathieson is prepared to furnish full information on Sodium Chlorite — and Mathieson's staff is ready to work with you now in adapting this outstanding chemical to your requirements. Write today!

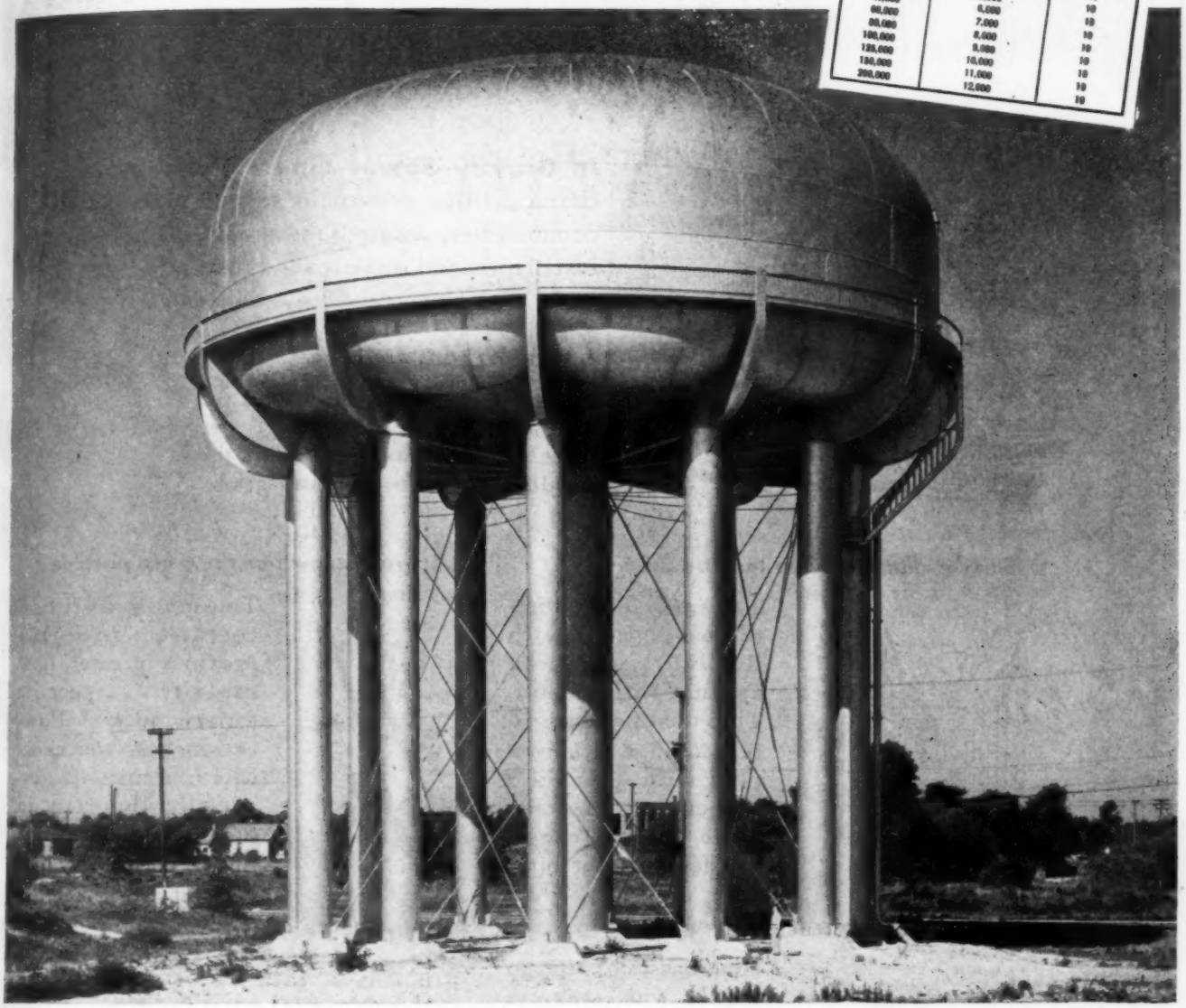
THE MATHIESON ALKALI WORKS (INC.) • 60 East 42nd Street, New York 17, N.Y.

SODIUM CHLORITE . . . CHLORINE DIOXIDE . . . HTH PRODUCTS . . . LIQUID CHLORINE . . . SODIUM METHYLATE . . . CAUSTIC SODA . . . SODA ASH . . . BICARBONATE OF SODA . . . FUSED ALKALI PRODUCTS . . . AMMONIA, ANHYDROUS & AQUA . . . SYNTHETIC SALT CAKE . . . DRY ICE . . . CARBONIC GAS

Mathieson
CHEMICALS

HORTON ELEVATED STORAGE
TO HELP MEET
Fire-Flow Requirements

Population	Required Fire-Flow For Average City—gpm	Hours Duration
1,000	1,000	4
1,500	1,000	4
2,000	1,250	4
3,000	1,500	5
4,000	1,750	6
5,000	2,000	7
6,000	2,250	8
10,000	2,500	9
13,000	3,000	10
17,000	3,500	10
22,000	4,000	10
28,000	4,500	10
40,000	5,000	10
50,000	6,000	10
80,000	7,000	10
100,000	8,000	10
125,000	9,000	10
150,000	10,000	10
200,000	11,000	10
	12,000	10



Most fires, thanks to modern construction requirements and fire fighting equipment, are of relatively short duration. In view of this fact it is possible to provide a reserve of water in elevated storage for fire requirements, thus preventing over-taxing of the water producing system.

If a municipality is to assure fire protection for its citizens in accordance with N.B.F.U. fire-flow requirements, careful study should be made whenever extensions or improvements to existing water distribution systems are being considered. The table shown above shows the approximate storage needed to meet recommended N.B.F.U. fire-flow requirements for average cities up to 200,000 population.

In communities of 200,000 population or less, water needed for extinguishing potential fires is usually greater than the maximum daily requirements for ordinary use. Many hydraulic engineers, suggest a reserve of plus 150% of the daily demand.

Equally important as the amount for fire-flow requirements is the proper location of the elevated storage tank. Whenever possible, tanks should be erected in the sections of the heaviest demand.

CHICAGO BRIDGE & IRON COMPANY

Chicago 4.....2198 McCormick Bldg.
New York 6.....3390-165 Broadway Bldg.
Cleveland 15.....2262 Guildhall Bldg.
Los Angeles 14.....1455 Wm. Fox Bldg.
Birmingham 1.....1586 North 50th Street
Atlanta 3.....2181 Healey Bldg.
Plant in Birmingham, Chicago and Greenville, Pa.

Tulsa 3.....1646 Hunt Bldg.
Houston 1.....5615 Clinton Drive
Philadelphia 3.....1644-1700 Walnut Street Bldg.
Washington 4.....703 Atlantic Bldg.
San Francisco 11.....1283-22 Battery St. Bldg.
Havana.....Edificio Abreu
In Canada: Horton Steel Works, Limited, Fort Erie, Ont.

THROUGHOUT THE SEWAGE SYSTEM...

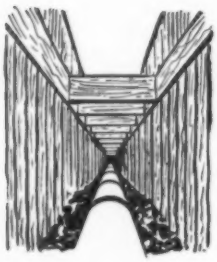
Transite Sewer Pipe provides

In *Gravity* Sewer Lines: Transite's unusual characteristics, proved in service in hundreds of communities, assure substantial savings both in installation and maintenance costs.

1. Handling costs are lower

Long 13-foot lengths and light weight mean greater footage per truckload . . . fewer man-hours for handling to lay to line and grade.

2. Smaller diameter pipe may be used



Transite's joints combine tightness with flexibility, guarding against infiltration. Thus total sewage load is reduced, which, coupled with Transite's higher flow capacity, often permits use of smaller diameter pipe.

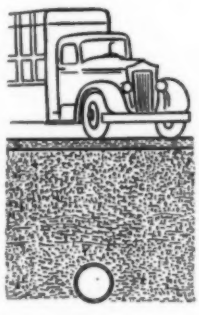
3. Lower excavation costs are possible

Transite's low friction coefficient (n=.010) provides greater flow capacity . . . permits flatter grades, shallower trenches, reduces excavation costs . . . especially important in the case of rock excavation or wet trenches.

4. Pipe laying costs are reduced

Four classes of pipe, to meet a wide range of strength requirements for all loading conditions, minimize need for costly concrete cradles. Transite's long lengths mean fewer joints to assemble.

5. Maintenance costs go down



Made of asbestos and cement, Transite Sewer Pipe is highly corrosion-resistant. Its tight joints guard against root trouble. And every length is factory-tested for strength and uniformity.

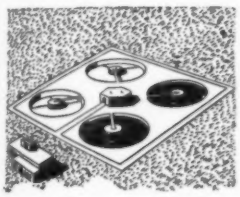
JOHNS MANVILLE JM PRODUCTS

Johns-Manville

these 7 special economies

And In Treatment Plants: Transite Sewer Pipe's light weight and long 13-foot lengths cut infiltration to a minimum, resulting in smaller loads for the treatment plant to handle, and effecting important economies in operation.

6. Treatment costs are less— plant capacity conserved



By cutting down on infiltration and reducing plant load, operating costs are lowered, conserving plant capacity for increased loads incident to future community growth.

7. Smaller treatment plants are possible

In designing new sewage facilities, Transite Sewer Pipe's reduced infiltration makes possible smaller treatment plants with substantial savings in the initial cost of both buildings and equipment.

and for *pressure* mains . . .

TRANSITE PRESSURE PIPE

For the pressure portions of the sewerage system, Transite Pressure Pipe assures the same economies of lowered installation and maintenance costs. Its high flow capacity (C=140) and freedom from tuberculation help keep pumping costs low.

For additional information about Transite Sewer Pipe, write for Brochure TR-21A (for gravity lines) and TR-11A (for pressure mains). Address Johns-Manville, 22 East 40th Street, New York 16, N. Y.

Transite Sewer Pipe

It pays to use EVERDUR for parts like these

. . . ***and parts like these:*** Coarse and Fine Screens, Float Chambers, Swing Gates, Built-up Sluice Gates, Coarse Bar Rack Aprons, Effluent Weirs and Scum Weirs, Structural Scum Baffle Brackets, Troughs, Screen Hoppers, Orifices, Baskets, Pipe, Ladders, Float Gage Chains, Valve Springs, Guides, Walkways, Electrical Conduit, Flashboard Supports, Flush Box Fittings, Spillway Fittings, Valve Stems.

THE EVERDUR* equipment illustrated, and the additional items listed, have given thoroughly satisfactory service . . . for periods up to 18 years.

The reasons for this record are readily evident: Everdur Copper-Silicon Alloy combines the corrosion resistance of copper with the tensile strength of mild steel. It thus provides trouble-free, economical service under severe conditions of both stress and corrosion.

Equally important from the standpoint of availability, this readily workable and weldable alloy is made in practically all commercial forms. For detailed information, write for Publications E-11 and E-6.

*Reg. U. S. Pat. Off.

ANACONDA *Everdur Copper-Silicon Alloy*

THE AMERICAN BRASS COMPANY—General Offices: Waterbury 88, Connecticut

Subsidiary of Anaconda Copper Mining Company • In Canada: ANACONDA AMERICAN BRASS LTD., *New Toronto, Ont.*

Buy Victory Bonds . . . Help assure World Peace

KEEP YOUR WATER SUPPLY

Safe

WITH DEPENDABLE UNIFORM

DIAMOND LIQUID CHLORINE

You can have complete confidence in the high quality of Diamond LIQUID CHLORINE. Made under closely-controlled manufacturing processes, it is dependable and pure. And regardless of the quantity you need, you can get Diamond LIQUID CHLORINE in convenient containers—individual cylinders, multi-unit cars or tank cars as required.

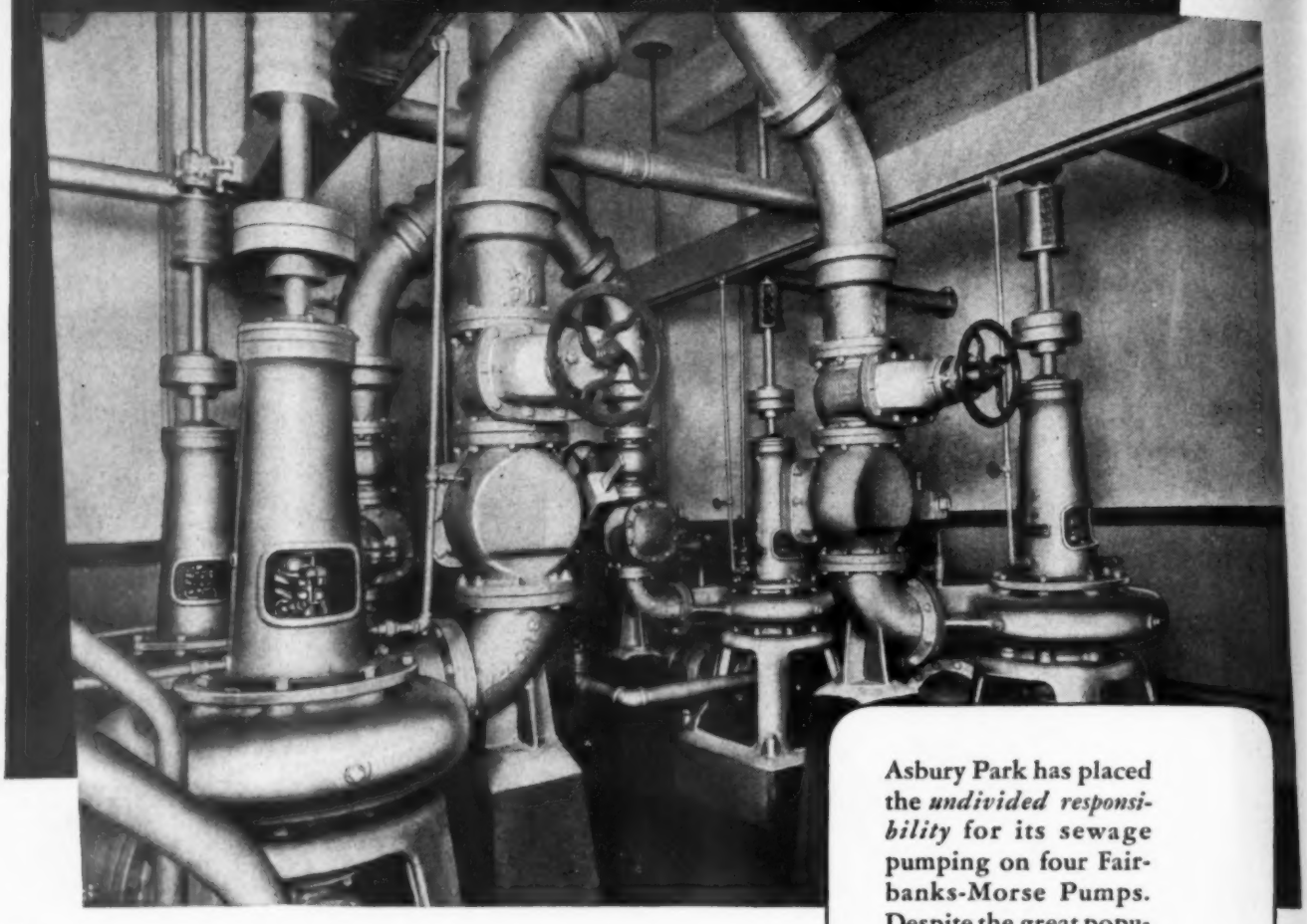
For complete satisfaction, standardize on DIAMOND. You will never regret your decision.

ALKALI

DIAMOND ALKALI CO.

PITTSBURGH 22, PA., AND EVERYWHERE

85% INCREASE IN SUMMER POPULATION
Presents No Sewage Problem for Asbury Park, N. J.



ASBURY PARK is another of the growing list of cities helping prove the advantages of Fairbanks-Morse nonclog Vertical Sewage and Trash Pumps.

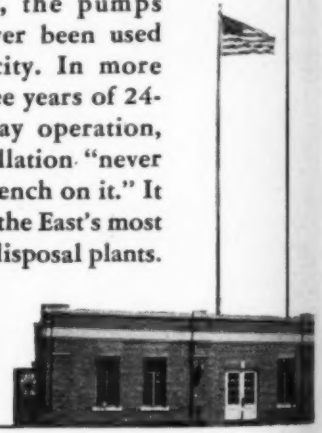
These pumps, outstanding in their field, are especially designed for economical handling of unscreened sewage.

Large solids and a high percentage of foreign matter do not affect their efficiency.

A streamlined, enclosed impeller; removable suction head, back head, and suction elbow; ball bearings in dust-proof housings; and many similar refinements contribute greatly to better operation at lower cost.

Consult a Fairbanks-Morse Engineer on your pumping problems. There is no obligation. Fairbanks, Morse & Co., Fairbanks-Morse Building, Chicago 5, Illinois.

Asbury Park has placed the *undivided responsibility* for its sewage pumping on four Fairbanks-Morse Pumps. Despite the great population increase each summer, the pumps have never been used to capacity. In more than three years of 24-hour-a-day operation, the installation "never had a wrench on it." It is one of the East's most modern disposal plants.



Fairbanks-Morse

A name worth FM *remembering*

Diesel Locomotives • Diesel Engines
Scales • Motors • Pumps • Generators
Magnetos • Stokers • Railroad Motor Cars and Standpipes • Farm Equipment

You can roll along smoothly
with AQUA NUCHAR ACTIVATED CARBON
No problems, no worries, not a care in the world when you have ample stocks of Aqua Nuchar Activated Carbon on hand. When you use Aqua Nuchar, your water will be free from objectionable tastes and odors because it removes by adsorption those elements which cause unpalatable water. An investment in Aqua Nuchar pays big dividends. More than 1,200 communities have used Aqua Nuchar to bring palatable water to their taxpayers at the astoundingly low average cost of less than two cents per capita per year. Aqua Nuchar is stocked at convenient points throughout the United States and Canada . . . ready to serve you on a moment's notice. Check your stocks of Aqua Nuchar today, and be prepared for any change that may arise in your raw water supply!

INSURES PALATABLE DRINKING WATER
NUCHAR

INDUSTRIAL CHEMICAL SALES
DIVISION WEST VIRGINIA PULP AND PAPER COMPANY
230 PARK AVENUE NEW YORK 17, N.Y.
35 E. WACKER DRIVE CHICAGO 1, ILLINOIS
748 PUBLIC LEDGER BLDG. PHILADELPHIA 6, PA.
CLEVELAND

STEEL IS "HONORABLY DISCHARGED" —and ready for your plans

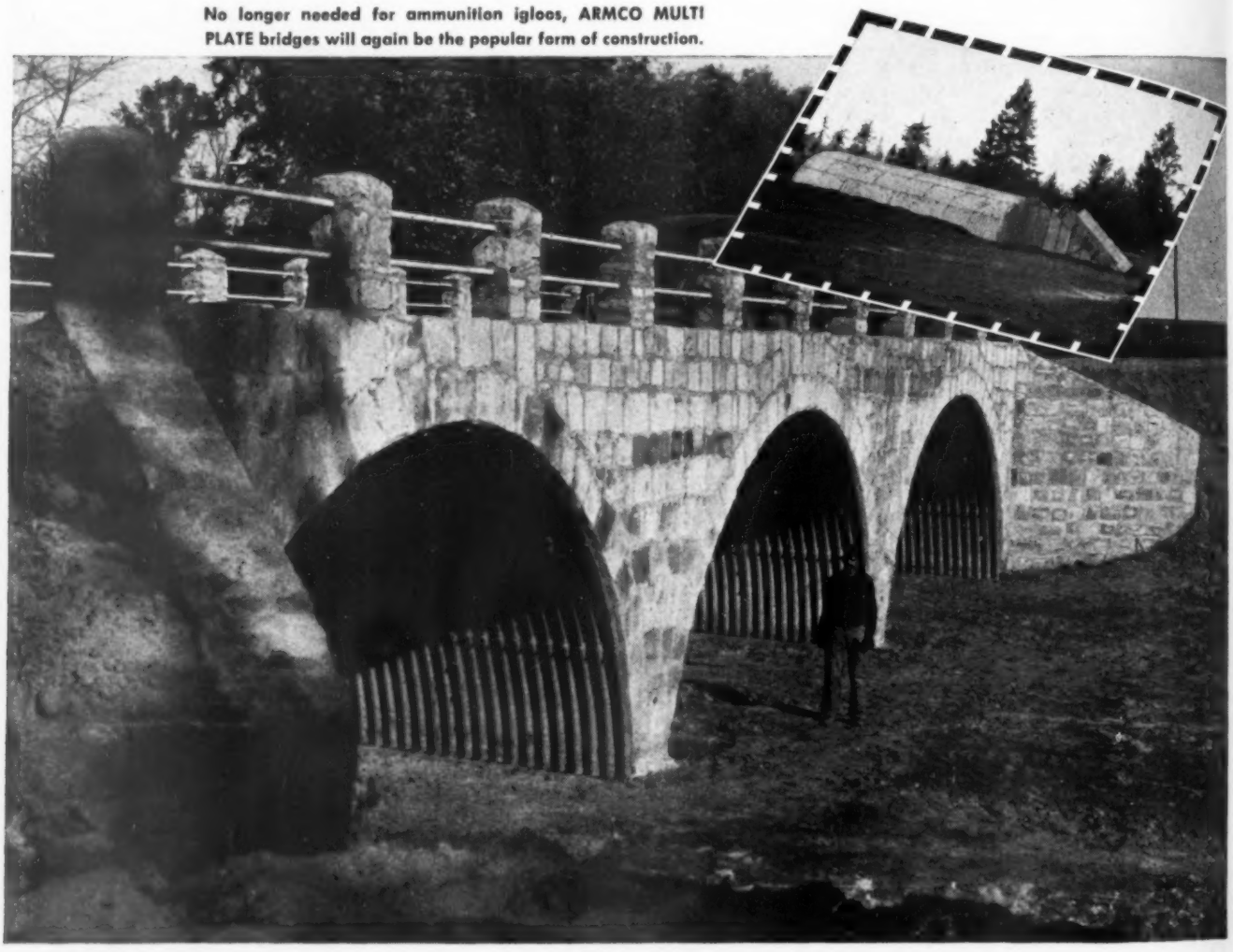
Now it's no longer necessary to substitute less satisfactory products for corrugated metal pipe.

With the war ended in Europe, Asia, and the Pacific, iron and steel have been "honorably discharged" and are again available for your drainage and other needs. During the days of material restrictions and substitutes you will recall how ARMCO Emergency Wood Pipe served a useful purpose. It was another unusual Armco service. But steel, so indispensable for ships, guns, equipment, landing mats, and for portable culverts in the forward areas, is also indispensable for peacetime construction.

Armco products have retained all their desirable features, such as light weight and ease of handling, flexibility and great strength. During their nearly forty years of distinguished service they have consistently proved their durability and saved taxpayers thousands of dollars. Now they are back in improved drainage and other structures—ready to serve you more efficiently and economically than ever before.

For immediate construction or for current and post-war plans, you will find Armco drainage and metal products a wise choice. Order them now or write for further information. Armco Drainage Products Association, 835 Curtis St., Middletown, O.

No longer needed for ammunition igloos, ARMCO MULTI PLATE bridges will again be the popular form of construction.



ARMCO

SCAN THIS LIST

ARMCO products: Corrugated Metal Pipe and Pipe-Arches, Paved Invert and Asbestos-Bonded Pipe, Perforated Pipe, MULTI PLATE Pipe, Arches and Pipe-Arches, Drainage Gates, Spiral Welded Pipe, Steel Sheeting, Retaining Walls, Tunnel Liner Plates, Guard Rail, End Sections.

Rust

Rust color in flowers is beautiful . . .

Rust colored . . . one of the rare species of Chrysanthemums.

Rust holds no attraction when it appears on a hard-working pressure tank or pump. It is steel's worst enemy. Under the impetus of water and corrosive elements, it gnaws greedily unless routed by mechanical and chemical protectors.

NO-OX-ID is such a protector . . . forming a plastic coating which immediately checks underfilm corrosion. Once coated with NO-OX-ID, steel is *always* steel . . . never oxide of iron.

There is a grade of NO-OX-ID to combat every corrosive condition. The special grades engineered for water and sewerage plants give full protection under the severe conditions encountered. Consistencies are dense, yet flexible and of sufficiently high melting point to withstand the summer sun without flowing; tough enough to stand zero temperatures without cracking.

Time does not change NO-OX-ID. It is always the same at a given temperature—remains in perfect bond with the metal which it protects.

Use NO-OX-ID in your reconditioning program, or apply it to new equipment and property—tanks, pipes, valves, or steel structures.

In reconditioning, NO-OX-ID may be applied without extensive precleaning. It promptly penetrates to the parent metal—stops further corrosion and loss of metal.

Send for complete details about consistencies suitable for use in water and sewerage plants and data regarding methods of application.

Educational Film

Educational motion picture, in color, showing methods and equipment for applying NO-OX-ID, available to interested groups. Let us know the date you wish to show the film in your community.

NO-OX-ID
IRON + OX = RUST

REG. TRADEMARK
AUG. 27, 1918

The ORIGINAL RUST PREVENTIVE

DEARBORN CHEMICAL
Dept. Y, 310 S. Michigan Ave., Chicago 4, Ill.
New York • Los Angeles • Toronto

Relieve HARMFUL STRESS AND STRAIN in condensed piping systems ...with Flexible Dresser Couplings

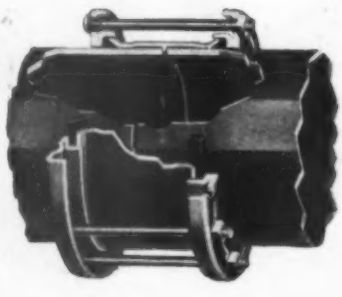
Regardless of pipe size or congestion of immediate surroundings, piping systems in filter plant pipe galleries can be installed with plain-end pipe and flexible Dresser Couplings faster and more economically than with flanged or other nonyielding joints. Because Dresser Couplings act as flexible sleeves and permit longitudinal adjustment of adjacent pipe ends, they absorb the misalignment which often occurs during erection of the piping system. They permit accurate connections to valves, filter boxes and other apparatus without imposing strains at any connection point in the piping system.

A defective valve or fitting can be replaced in minimum repair time, using a Dresser Coupling without centering pipe-stops. Simply unbolt the two nearest couplings, slide all coupling rings along either adjacent pipe away from joint position to replace a valve or fitting. Then slide all coupling rings back to their original position and rebolt in place. In the cases of pipe connections to valves, fittings, apparatus, etc., specify "couplings without pipe stops".

On the opposite page are illustrated typical congested area pipe connections using Dresser Couplings. Connections such as these are only a part of the job done by Dressers. There is a Dresser Coupling for any plain-end application. For complete information, please send us your inquiry.

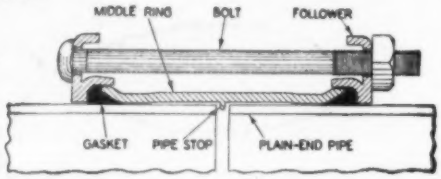
DRESSER MANUFACTURING DIVISION
Bradford, Pennsylvania
In Texas: 1121 Rothwell Street, Sec. 16, Houston, Texas
In Canada: Dresser Manufacturing Co., Ltd., 60 Front St., West, Toronto, Ontario

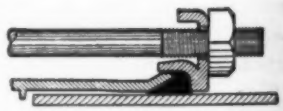
Here's Why Dresser Couplings Absorb Vibration and Stay Tight



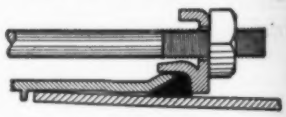
The cutaway at left and cross section below show the simplicity of Dresser construction. Dresser Couplings stay tight for life because any axial or longitudinal stresses that would normally be destructive, are absorbed by the resilient gasket seal which permits 4 degrees or more deflection (depending on diameter) and 3/8 inch longitudinal movement per coupling. (Illustrated at right.)

This simple construction—the few interchangeable parts which can be assembled only in one way—assures correct installation.





Pipe in straight position

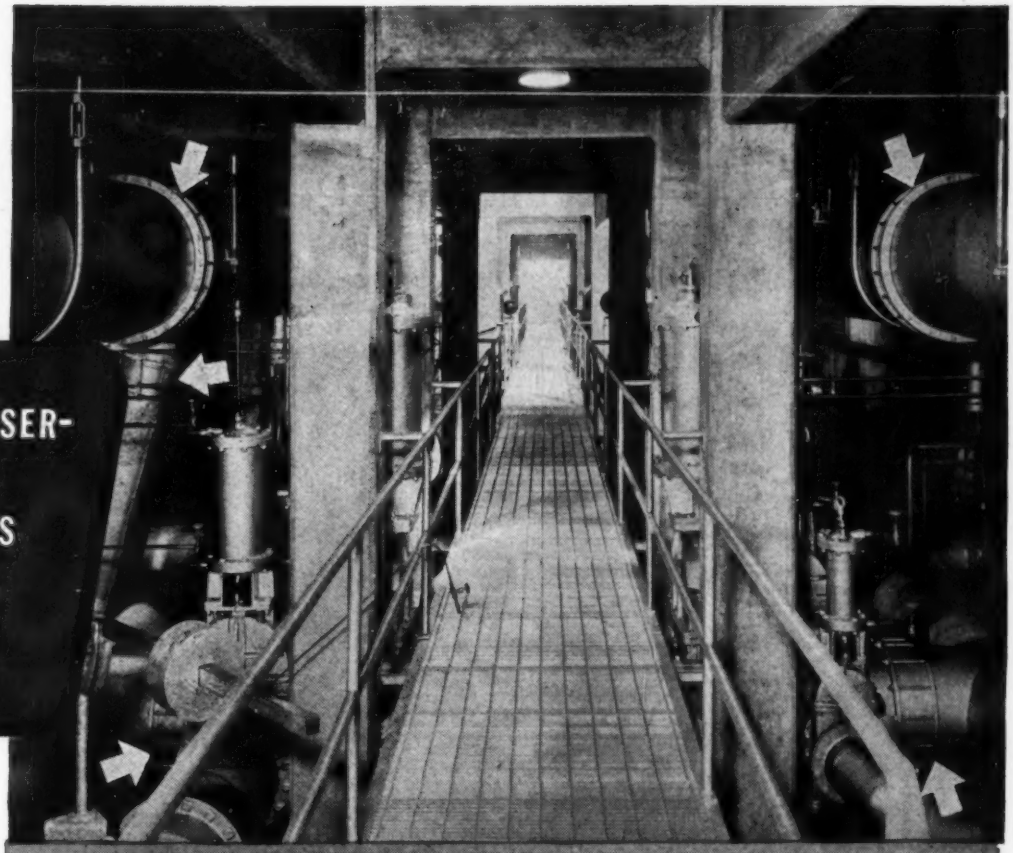


Pipe in deflected position

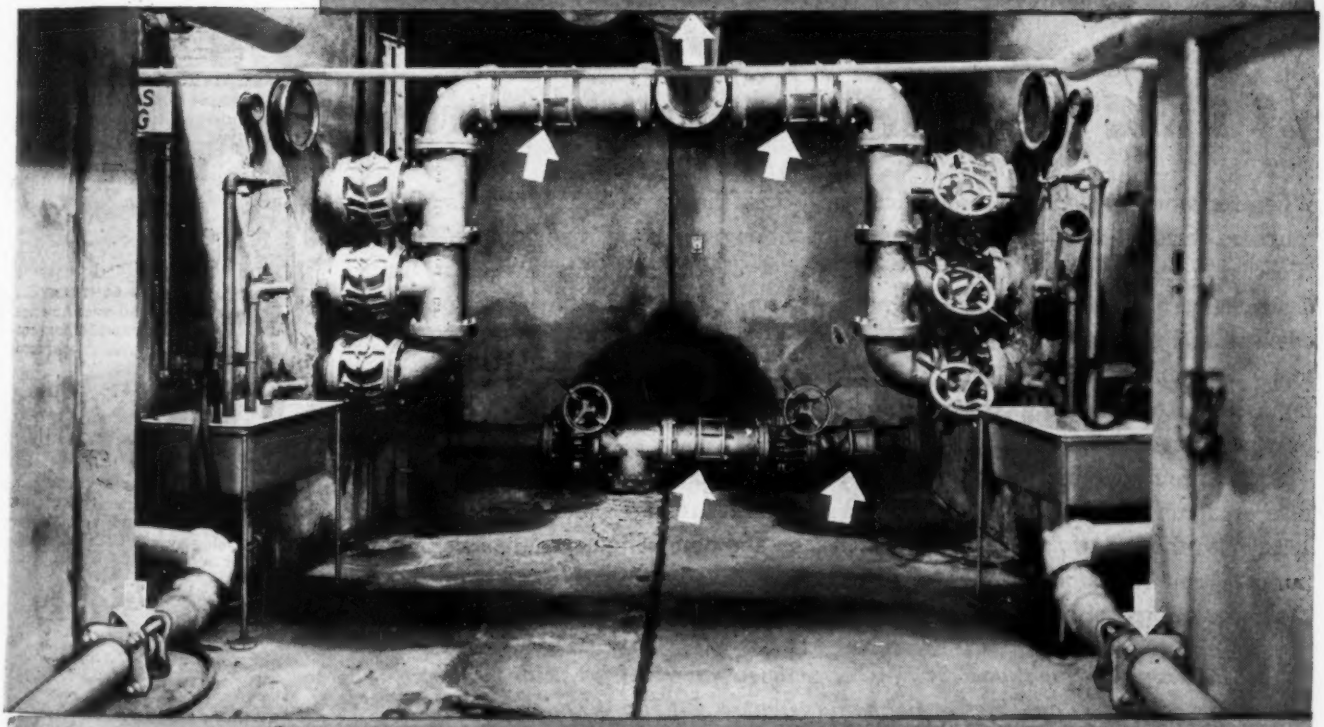
DRESSER

ONE OF THE DRESSER INDUSTRIES

TYPICAL DRESSER-COUPLED CONNECTIONS IN A WATER FILTER PLANT



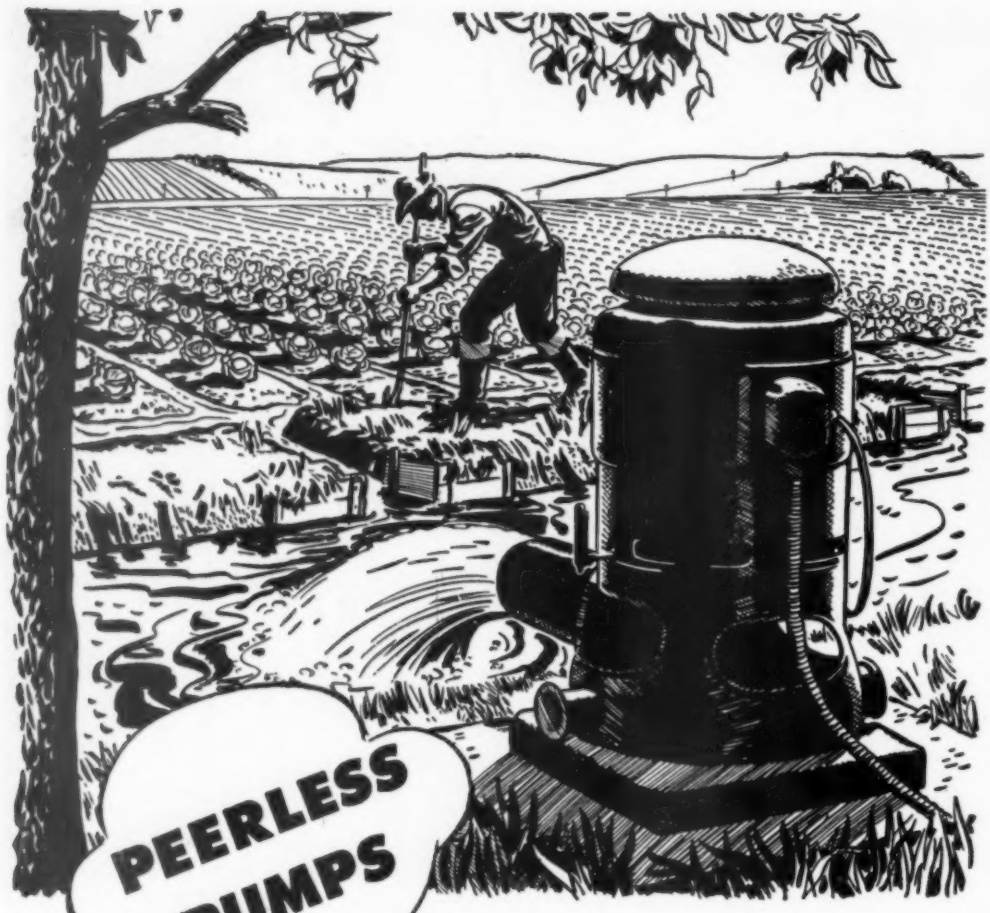
WATER FILTRATION PLANT PIPE GALLERY. Pipe, valves and fittings are joined with flexible Dresser Couplings. Result: Reduced erection costs, plus long, trouble-free service.



SEWAGE PLANT CONTROL ROOM. Pipe, valves and fittings are joined with flexible Dresser Couplings for protection against stresses occurring from misalignment with consequent fatigue failure. Result: Lower installation cost, long service, with low maintenance. Joints stay permanently tight.

C O U P L I N G S

FOR PLAIN-END PIPE



...Reflect over 60 Years of FMC Research & Engineering

Wherever water is pumped throughout the world, the name "Peerless" is familiar to ranchers, farmers, municipal and industrial plant engineers, and many others. To them, "Peerless" means pumps—Turbine, Hi-Lift, Hydro-Foil, and Centrifugal—whose advanced design, superb engineering, and mechanical perfection assure more years of trouble-free, efficient, and economical service. To them, there is no pump like a Peerless, with its many outstanding features—practically indistructible bearings and die-cast rotors, automatic lubricators assuring positive and uniform oil feed, dynamically balanced impellers preventing overload, and many others.

Such a reputation is understandable when you consider that Peerless Pumps are products of a company which has pioneered in original research and engineering since 1883. With the country's foremost research men and pump engineers, the most modern pump testing laboratories, and more than sixty years of experience to draw upon, Food Machinery Corporation will *keep* the name "Peerless" first in pumps.

Peerless Pumps are made by FMC's Peerless Pump Division, with factories at Los Angeles and Fresno, California; Canton, Ohio; and Quincy, Illinois.

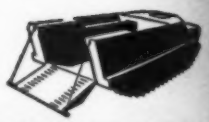
FOOD MACHINERY CORPORATION

FMC
FOOD MACHINERY CORPORATION

EXECUTIVE OFFICES: SAN JOSE 5, CALIFORNIA

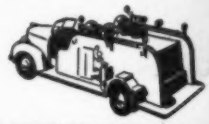
Manufacturing Divisions: ANDERSON-BARNGROVER & BEAN-CUTLER DIVISIONS, SAN JOSE, CALIFORNIA • PEERLESS PUMP DIVISION, LOS ANGELES AND FRESNO, CALIFORNIA; CANTON, OHIO; QUINCY, ILLINOIS JOHN BEAN MFG. CO. DIVISION, LANSING, MICHIGAN • SPRAGUE-SELLS DIVISION, HOOPESTON, ILLINOIS • FOOD MACHINERY CORPORATION, RIVERSIDE, CALIFORNIA; DUNEDIN AND LAKELAND, FLORIDA; HARLINGEN, TEXAS NIAGARA SPRAYER & CHEMICAL CO., INC., MIDDLEPORT, NEW YORK, *Subsidiary of Food Machinery Corporation*

Other Products of FMC Research and Engineering



THE "WATER BUFFALO" amphibious tractor hauls cargo on water and over the roughest terrain where no other vehicle can go.

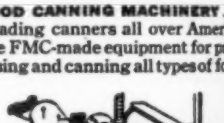
FLAVORSEAL... the porous protective film sprayed over fresh fruits and vegetables, annually saves tons of produce from spoiling.



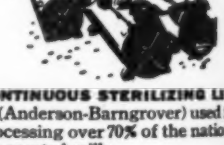
FMC ORIGINAL FOG FIRE FIGHTER ... revolutionary equipment that quickly extinguishes the hottest fires without usual water damage.

INSECTICIDES AND FUNGICIDES ...a complete line of chemical dusts and sprays which increase yield and quality of crops.

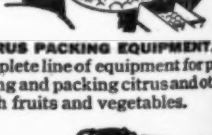
FOOD CANNING MACHINERY... Leading canners all over America use FMC-made equipment for processing and canning all types of food.



CONTINUOUS STERILIZING LINE ... (Anderson-Barngrover) used for processing over 70% of the nation's evaporated milk.



CITRUS PACKING EQUIPMENT... a complete line of equipment for processing and packing citrus and other fresh fruits and vegetables.



CROP SPRAYERS... a complete line of crop spraying equipment embodying the famed Bean High Pressure Spray Pumps.

THE PERFECT
BLEACH · GERMICIDE
DISINFECTANT

For laundries, PITTCHLOR provides quick, uniform bleach solutions which mean spotless white work and proper fabric care.

For water purification and sewerage treatment . . . for sanitation in and around all publicly used areas, such as swimming pools, shower baths, lavatories, etc., PITTCHLOR provides the positive protective action of chlorine in the simplest, most economical manner.

Pittchlor Is Easy and Economical to Use

...when you want a certified high-test Calcium Hypochlorite

For any of the scores of uses for Calcium Hypochlorite, it's reassuring to order PITTCHLOR—the Columbia Calcium Hypochlorite which contains a minimum of 70% available chlorine. PITTCHLOR is non-caking and free-flowing . . . dry and practically dustless.

Supply solutions of Calcium Hypochlorite or Sodium Hypochlorite can be made easily and quickly, for use as required.

PITTCHLOR is packed in the readily identified, colorful red, white, and blue 5-lb. resealable and 3¾-lb. cans; also in standard 100-lb. drums. Distributed through leading jobbers.

COLUMBIA CHEMICALS

PITTSBURGH PLATE GLASS COMPANY · COLUMBIA CHEMICAL DIVISION
GRANT BUILDING, PITTSBURGH 19, PENNSYLVANIA

Chicago · Boston · St. Louis · Pittsburgh · New York · Cincinnati · Cleveland · Philadelphia · Minneapolis · Charlotte · San Francisco

Pumps 400 times its own Weight Every Hour!

This fully portable Gorman-Rupp pump that weighs only 60 pounds will handle 400 times its own weight in water every hour, against a 20-foot head. In gallons, this is 3,000 per hour. A mere handful of pump – it does a man-sized job!

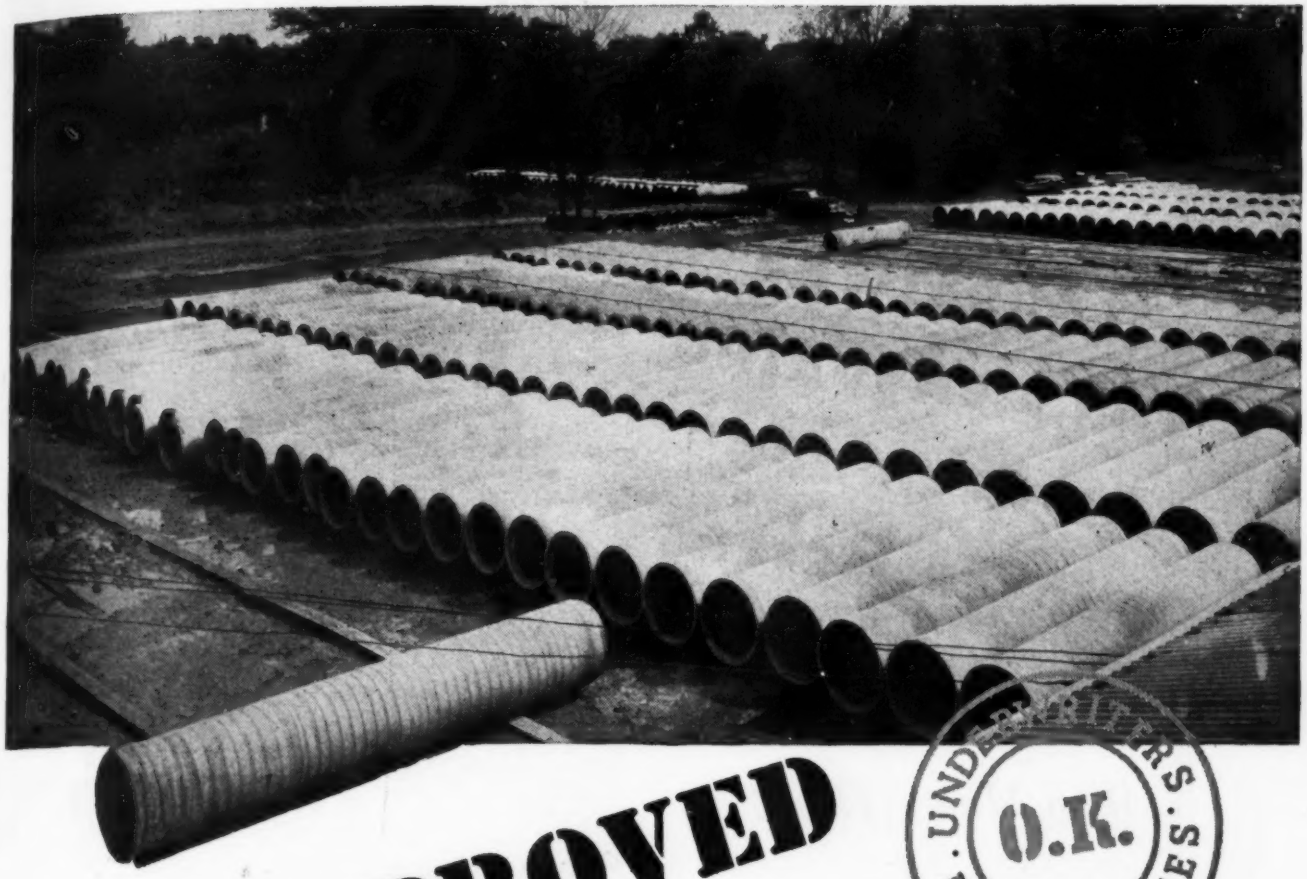
And it will keep on doing it. Priming is automatic. Just start the motor and you start the water, without making any adjustments. No muck or solids that can pass the intake will clog or harm the pump. Gorman-Rupp design is the simplest, most rugged ever offered in self-priming centrifugal pump. Compared on the basis of cost, power, or weight, a Gorman-Rupp pump will out-perform anything you can buy; and this statement is backed by a money back guarantee.

Whatever size your pumping job may be, up to 125,000 gallons per hour, your best choice is Gorman-Rupp.

GORMAN-RUPP PUMPS — UNSURPASSED FOR PUMPING FAST

THE GORMAN-RUPP COMPANY

327 BOWMAN STREET • MANSFIELD, OHIO



APPROVED

....by Underwriters' Laboratories

UNDERWRITERS' LABORATORIES O.K.

● On November 24, 1944, after rigid tests and exhaustive investigation, Underwriters' Laboratories, Inc., sponsored by the National Board of Fire Underwriters, recommended to the Fire Council of Underwriters' Laboratories, Inc., the acceptance of Lock Joint Prestressed Concrete Cylinder Pipe of the 150 lb. class in sizes from 20″ to 42″ for use in public and private waterworks and fire service systems. This recommendation was accepted December 21, 1944.

LOCK JOINT
Reinforced Concrete
PRESSURE PIPE

LOCK JOINT PIPE COMPANY

Established 1905

P. O. BOX 269, EAST ORANGE, NEW JERSEY

Denver, Colo. • Chicago, Ill. • Kenilworth, N. J. • Kansas City, Mo. • Rock Island, Ill.
Joplin, Mo. • Valley Park, Mo. • Cleveland, Ohio • Hartford, Conn. • Navarre, Ohio

SCOPE OF SERVICES Lock Joint Pipe Company specializes in the manufacture and installation of Reinforced Concrete Pressure Pipe for Water Supply and Distribution Mains in a wide range of diameters as well as Concrete Pipe of all types for Sanitary Sewers, Storm Drains, Culverts and Subaqueous lines.

TWO "YARDSTICKS" FOR MEASURING WATCH DOG WATER METERS

1. Who Makes Them?
2. Who Uses Them?

1. Made by Worthington-Gamon. When you specify Watch Dog Water Meters you get the design and performance advantages that result from the know-how of the oldest water meter manufacturer in the business . . . backed by the largest research and production facilities in the field of hydraulics. You also get the service offered by 24 district offices in 24 leading cities.

2. Used by thousands of municipalities and private water companies in the United States and abroad. It stands to reason that the meter that is first choice can also meet your specifications for accuracy, low maintenance, long life. Investigate Watch Dogs.

WORTHINGTON-GAMON METER COMPANY
282-296 SOUTH STREET
NEWARK, NEW JERSEY
Subsidiary of
WORTHINGTON
PUMP AND MACHINERY CORPORATION

GS.5

The Meter Specified in the Largest Contracts Ever Awarded in the U. S.

WATCH DOG WATER METERS

"Watch Dog" models...made in standard capacities from 20 G.P.M. up; frost-proof or split case in household sizes. Disc type, Turbine type or Compound type. Write for Bulletin.

TEN REQUIREMENTS
FOR UNDERGROUND MAINS
under normal conditions

Long Life: In evaluating bids, the useful life of cast iron pipe is figured at 100 years minimum.

Carrying Capacity: The carrying capacity of standard tar-coated cast iron pipe remains practically unimpaired for centuries. For the certain areas where tuberculating water is encountered, cement-lined cast iron pipe is available. Under such conditions, no other material offers the combined long life and sustained carrying capacity of cement-lined cast iron pipe.

Tight Joints: For *ordinary* pressures, cast iron bell-and-spigot pipe—for *high* pressures, cast iron mechanical joint pipe—are known to be leak-proof.

Tensile Strength: When tested under hydrostatic pressure to destruction, the ultimate tensile strength of cast iron pipe is a minimum of 11,000 p.s.i. for pit cast pipe and a minimum of 18,000 p.s.i. for cast iron pipe made by other methods.

Beam Strength: Under beam stress tests, 10 ft. span, standard 6" cast iron pipe sustains a load of 15,000 pounds and bends approximately one inch before breaking.

Toughness: Under hydrostatic pressure and the impact of a 50 lb. hammer, standard 6" cast iron pipe does not crack until the hammer is dropped four feet.

Internal Pressure: An average of many internal hydrostatic pressure tests on standard 6" cast iron pipe shows this pipe withstands more than 2500 pounds pressure per square inch.

External Load: In regulation ring compression tests, standard 6" cast iron pipe withstands a crushing weight of more than 14,000 lbs. per foot.

Imperviousness: The walls of cast iron pipe are impervious to leakage, seepage, or sweating of water, gas or chemicals under internal pressure tests.

Tapping: Cast iron pipe can be tapped cleanly with strong, tough threads, losing little in structural strength.

Other pipe materials meet some of these requirements but only cast iron pipe meets them all.

Whether a pipe material is able to fulfill these requirements is a matter of experience rather than prediction. A page of history is worth a volume of sales claims. History proves that cast iron pipe has been meeting these ten requirements for generations.

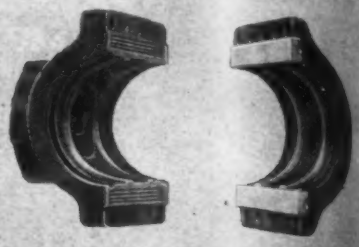
Cast Iron Pipe Research Association, Thomas F. Wolfe, Research Engineer, Peoples Gas Building, Chicago 3.

CAST IRON PIPE
SERVES FOR CENTURIES

CAST IRON

. . Here is a Mueller Tapping Sleeve

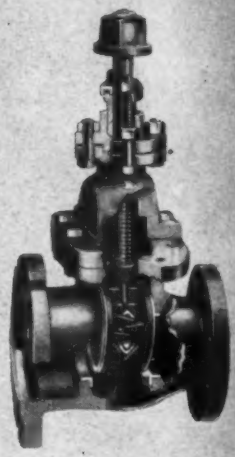
Branch connections, being the pivotal points, are subject to more than usual strain. So each MUELLER Tapping Sleeve is designed with extra thick wall sections and scientifically placed reinforcing ribs. This sleeve actually strengthens the main. Note the special lead gaskets which squeeze into grooves cut in the machined joint faces. End joints may be poured separately. No need to fill the sleeve full of lead. Saves ½ to ⅔ on the lead and cuts installation time. Forms a leak-proof connection that holds up for years.



Sleeve Halves Opened Out

. . Here is a Mueller Tapping Valve

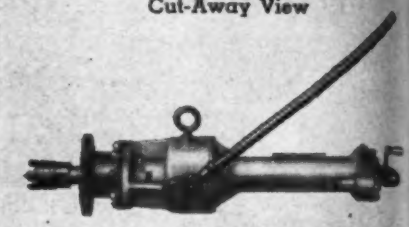
The MUELLER Tapping Valve has all the features found in the famous MUELLER-COLUMBIAN A.W.W.A. Gate Valves. Four-point wedging mechanism in the gate assembly; ball-joint follower ring in the packing gland; all working parts of enduring bronze; and many others. The cut-away view at the right shows the superior construction of this valve. Designed especially for use with MUELLER Sleeves, here is a combination that will give you many decades of faithful performance with little or no costs for repairs and upkeep.



Cut-Away View

. . Here is a "C-C" Drilling Machine

This MUELLER "C-C" Drilling Machine was planned especially for use with the sleeves and valves shown here. Has automatic or hand feed. Light, oil-tight case keeps out all dirt and grit and holds in the gear lubricant. The special pilot drills and shell cutters are of high grade tool steel. Stay sharp a long time. Cut clean holes – ranging from 2" to 12". Make your equipment complete. Order a "C-C" Drilling Machine today.



. . STOP THOSE LOSSES!

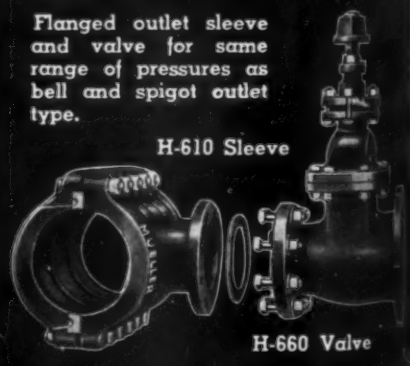
Thousands of dollars are lost to water works yearly through imperfect underground connections which sap water, pressure, and budgets. The chief foe of good connections is poor work at the sleeve. No solid-poured sleeve is flexible enough to absorb vibration and shock. Oftentimes the lead is further loosened when the cut is made. Any defects, however slight, bring leaks with resulting drop in pressure and loss of water. Valves of inferior design can likewise cause difficulty through inefficient operation. The intelligent solution to these problems is simple. Stock dependable MUELLER Equipment. Every item is made of top grade metals. Correct design and precision workmanship insure quality products. Rigid inspection and actual tests under pressure guarantee life-time service. Stop those losses! Cut costs, reduce service calls, and save time and money. Order MUELLER Tapping Sleeves and Valves now.

Bell and Spigot Outlet, test pressure, 300 lbs. Water working pressure, 150 lbs. Special types for higher pressures.

H-605 Sleeve

H-655 Valve

Flanged outlet sleeve and valve for same range of pressures as bell and spigot outlet type.

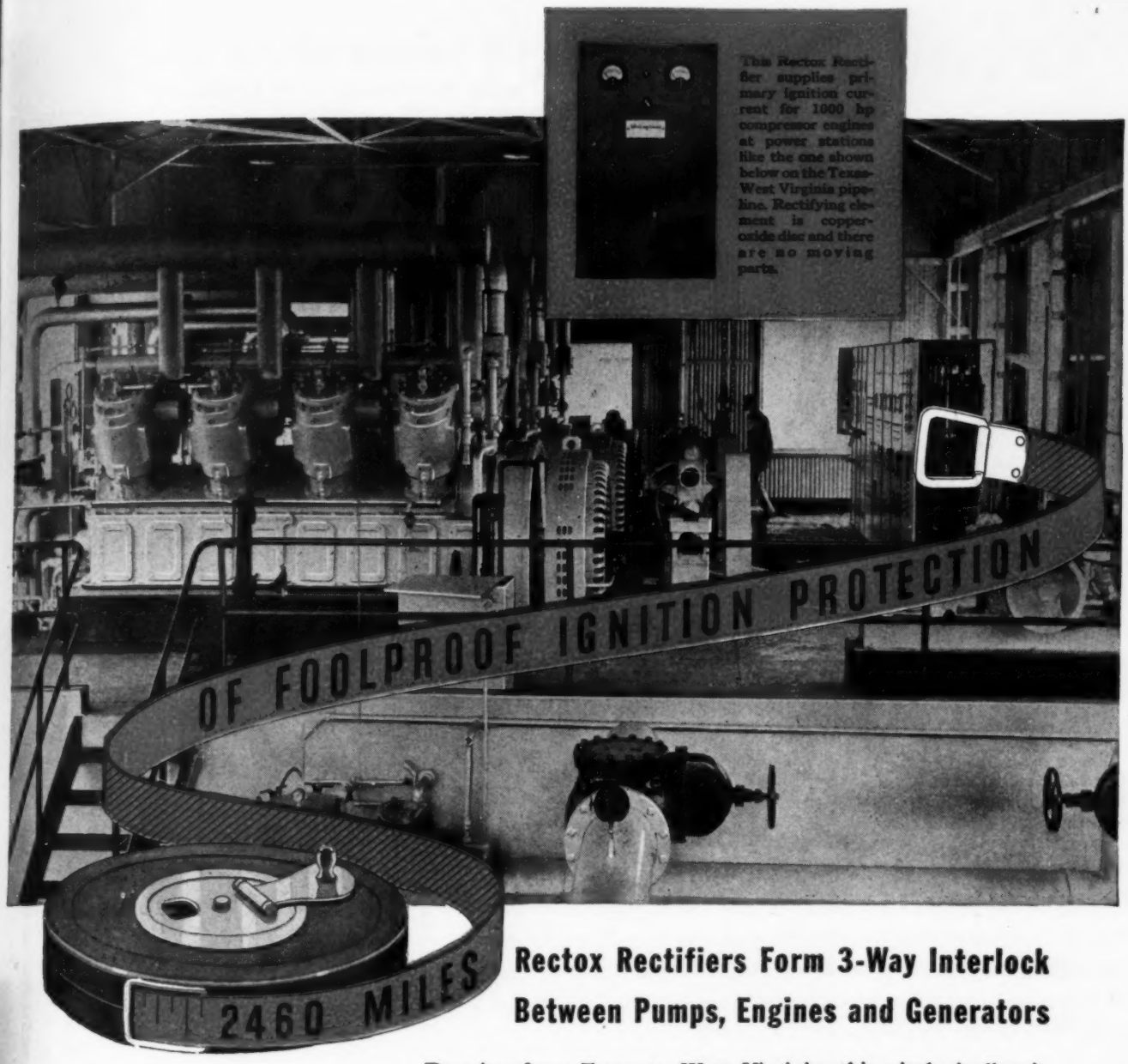


H-610 Sleeve

H-660 Valve

FOUNDED 1857

MUELLER CO., CHATTANOOGA, TENN.
DECATUR, ILL. LOS ANGELES, CALIF.


This Rectox Rectifier supplies primary ignition current for 1000 hp compressor engines at power stations like the one shown below on the Texas-West Virginia pipeline. Rectifying element is copper-oxide disc and there are no moving parts.
OF FOOLPROOF IGNITION PROTECTION
2460 MILES

Rectox Rectifiers Form 3-Way Interlock Between Pumps, Engines and Generators

Running from Texas to West Virginia, this vital pipeline is powered by a foolproof interlocking ignition system between main engines, water pumps and generators.

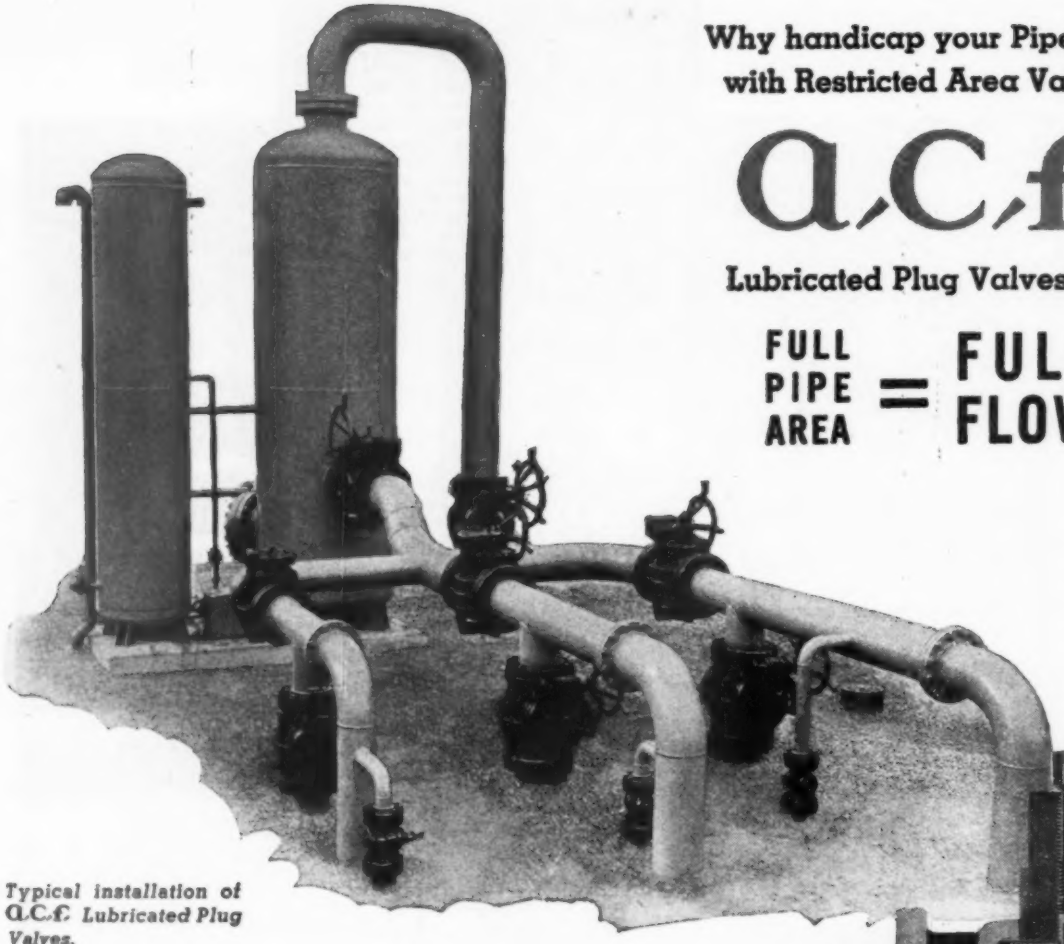
If electric power from the station generators fails, this shuts down the motor-driven circulating pumps supplying cooling water to the main engine-driven compressors. The engines must then be stopped immediately to prevent overheating. With this ingenious tie-in of the engine ignition supply, failure of station electric power kills the engine ignition simultaneously with stoppage of the circulating pumps.

The engine ignition system is d-c impulse type with individual induction coils for each spark plug. A Rectox Rectifier supplies the necessary d-c power to each induction coil. The Rectox units are equipped with voltmeter, ammeter, circuit breaker and rheostat. They operate from the station power supply which is 440 volts, 3-phase, 60 cycles . . . rectified output is 10-14 volts, 2 to 4 amperes, d-c. There are no batteries in the ignition circuit.

There are other advantages, too. The Rectox system costs less to install than a magneto or central battery circuit. And maintenance is considerably lower. Get the complete story of Rectox Rectifiers from your nearest Westinghouse office. Westinghouse Electric Corporation, P. O. Box 868, Pittsburgh 30, Pa. J-21360

Westinghouse
PLANTS IN 25 CITIES . . . OFFICES EVERYWHERE
RECTOX RECTIFIERS

ANOTHER WESTINGHOUSE FIRST IN THE PETROLEUM INDUSTRY



Typical installation of a.C.f. Lubricated Plug Valves.

Why handicap your Pipe Lines with Restricted Area Valves?

a.C.f.

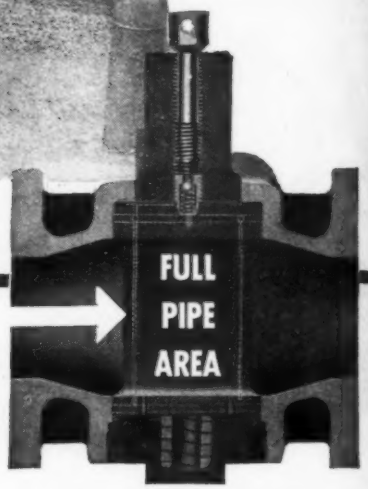
Lubricated Plug Valves give

FULL PIPE AREA = FULL FLOW

If difficult ladings are choking your pipe lines, a change to a.C.f. Lubricated Plug Valves can work wonders. How? Because the cylindrical plug provides a well-proportioned, round-cornered, *full pipe-area* port opening for unrestricted flow and full pressure of fluids. There is no change of flow direction, turbulence is overcome — and since flow velocities are not increased (abrasion being reduced) valve life is extended.

a.C.f. Lubricated Plug Valves operate easily and at a quarter turn. Balancing of lubricant pressures against line pressure makes them tight against head leaks. Even in the open position they have no seating surfaces exposed to lading wear and the lubricant keeps corrosion at a minimum. Compact, and with the fewest possible parts, a.C.f. Lubricated Plug Valves may be installed in any position. a.C.f. Lubricated Plug Valves will efficiently handle all processing and industrial plant ladings.

Representatives in principal cities carry adequate warehouse stock for quick delivery.



"TAILOR-MADE" FOR SEWAGE LINES

Liquids bearing solids in suspension such as sewage sludge, and most granular or similar solids are easily controlled. Send for Catalog No. 3-W.

AMERICAN CAR AND FOUNDRY COMPANY

Valve Department
30 Church Street, New York 8, N. Y.

THE *Facts* you need— on BETTER WATER SERVICE

MODERN WATER STORAGE *in* ELEVATED STEEL TANKS

Write—

FOR YOUR COPY OF THIS NEW 28-PAGE BOOK—JUST OFF THE PRESS . . . . . COMPREHENSIVE, DETAILED, KEYED TO YOUR REQUIREMENTS!

by PITTSBURGH · DES MOINES

PITTSBURGH · DES MOINES STEEL CO.

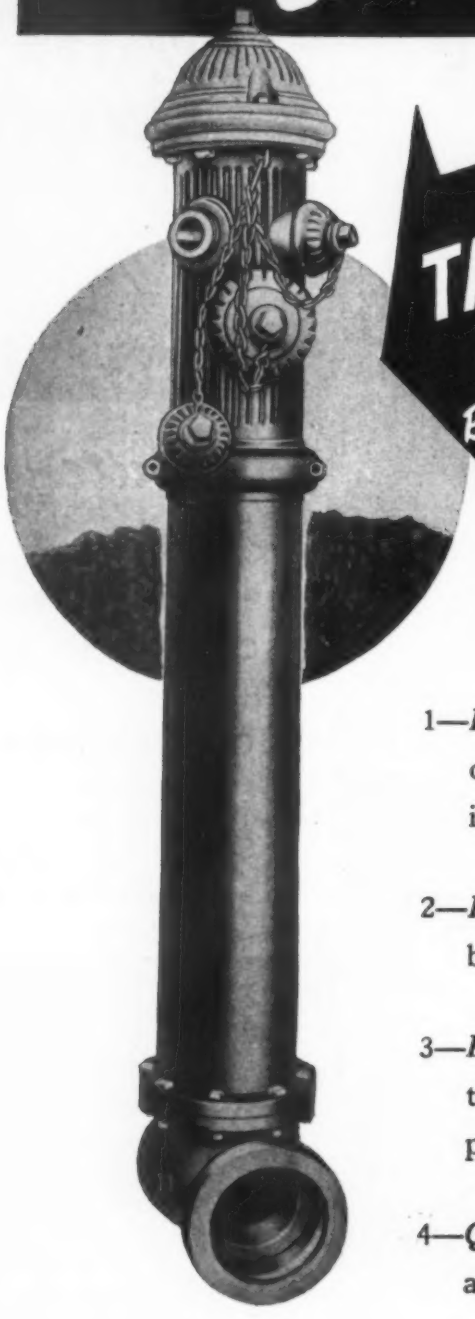
PITTSBURGH, PA., 3412 NEVILLE ISLAND—DES MOINES, IOWA, 913 TUTTLE STREET

NEW YORK, ROOM 915, 270 BROADWAY · CHICAGO, 1216 FIRST NATIONAL BANK BUILDING

DALLAS, 1217 PRAETORIAN BUILDING · SAN FRANCISCO, 619 RIALTO BUILDING

SEATTLE, 520 FIRST AVENUE, SOUTH

FROST CAN'T BUDGE A SMITH HYDRANT



THE TAPERED BARREL BREAKS THE GRIP

The tapered barrel of the SMITH Protectop Hydrant prevents frost-swollen ground from gripping the barrel, heaving it upward, dislocating the hydrant, and straining the connections. As the earth rises with expansion, it slides upward along the narrowing taper of the barrel, releasing the grip.

Only SMITH *has all of these* FEATURES

1—*Positive action drain;* always closed when the main valve is open, opening, or even partially open. When the main valve is closed the drain is always open.

2—*Low friction loss.* Barrel cross-section exceeds valve area by 200%.

3—*Protectop breakable coupling.* Patented coupling construction confines breakage to quickly and inexpensively renewed parts.

4—*Quick accessibility.* All working parts are easily removed and replaced, without excavation.

FIRE HYDRANTS
GATE VALVES
CHECK VALVES
INSERTING VALVES
TAPPING SLEEVES AND VALVES
WATER SERVICE BRASS GOODS

THE A. P. SMITH MFG. CO.

EAST ORANGE, NEW JERSEY

FLOOR STANDS
INDICATOR POSTS
TAPPING MACHINES
INSERTING MACHINES
PIPE CUTTING MACHINES
CORPORATION TAPPING MACHINES

Optimum pH

was a problem in Oklahoma City

Note the past tense—it *was* a problem until threshold treatment with Calgon* solved it.

Here's the story, extracted from an article by Frank S. Taylor, engineer in the Oklahoma City Water Department, read before the Southwest Section AWWA Conference.

Softening of the Oklahoma City water supply greatly reduced the formation of scale in hot water heater coils but a problem soon arose due to corrosion of the galvanized hot water tanks which had formerly been protected by this same scale formation. In addition there were complaints due to corrosion and consequent "red water" in all the dead ends and even in some of the circulating lines.

Raising the pH proved of little benefit and caused trouble due to clogging of meters. In addition, much of the calcium carbonate that was precipitated came down as a loose sludge instead of a protective scale on the pipe walls. This sloughed off frequently to cause more complaints of dirty water.

Feeding Calgon to the filtered water effluent put an end to the difficulty. Meters gave trouble for about three months, as accumulated sludge and scale were gradually eliminated, but since that time meter trouble has been below average.

Customers have been well pleased with results, and the water department has been able to discontinue flushing of dead ends, which, previous to Calgon treatment, had to be done every week.

The cost of this Calgon treatment has been very small and the benefits large.

**Calgon is the registered trade-mark of Calgon, Inc., for its glassy sodium phosphate products.*

HAGAN HALL BUROMIN CALGON

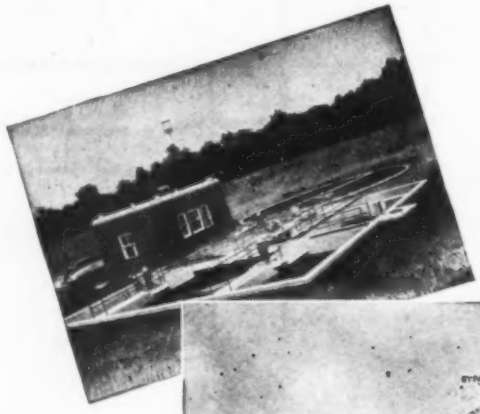
calgon, inc.

A SUBSIDIARY OF HAGAN CORPORATION

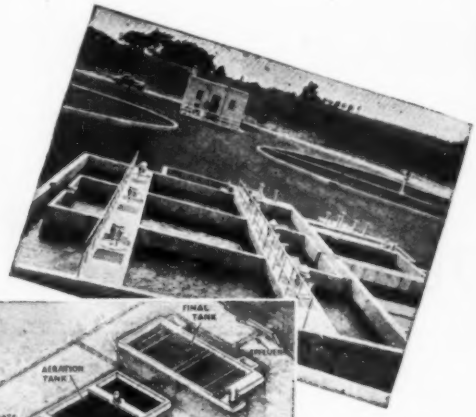
HAGAN BUILDING PITTSBURGH 30, PA.

American Bio-Activation

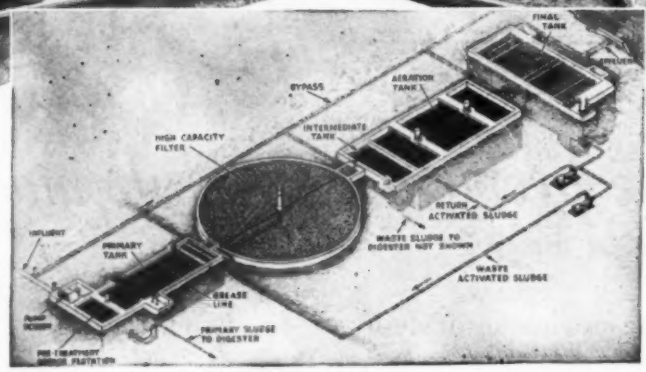
WASTE TREATMENT



COVINGTON
OHIO



CHILTON
WISCONSIN



FLOW SHEET

Bio-Activation combines the best qualities of both the trickling filter and the activated sludge process to produce a completely stable, nitrified effluent, low in B. O. D. and suspended solids.

TYPICAL OPERATING RESULTS

	Domestic, Malt, Brewery and Canning Wastes	
	5 BOD	Suspended Solids
Raw Waste	342	370
Primary Effluent	235*	134
Influent to Filter	510†	.....
Filter Effluent	99	143
Intermediate Effluent	58	65
% Reduction Filter Influent through Intermediate Effluent	89.5	.....
Final Effluent	13	15
% Overall Removal	97.5	96

*High Soluble 5 BOD from malt and brewery.
†Pea waste; 600-1200 ppm. 5 BOD, added in primary effluent.

Blue Print Now!— Send for Bulletin No. 259

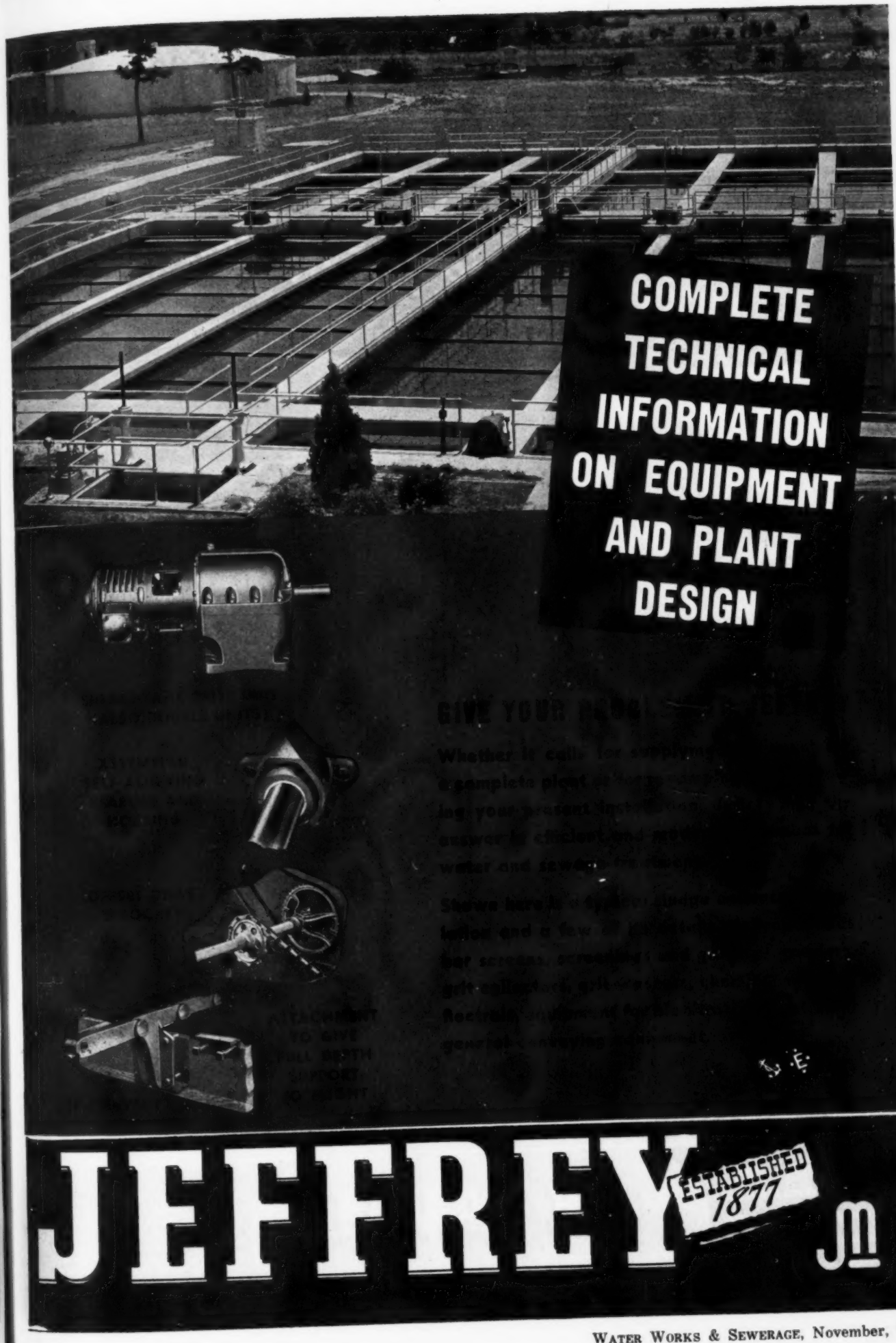
AMERICAN
ESTABLISHED 1868

THE AMERICAN WELL WORKS

Manufacturers of

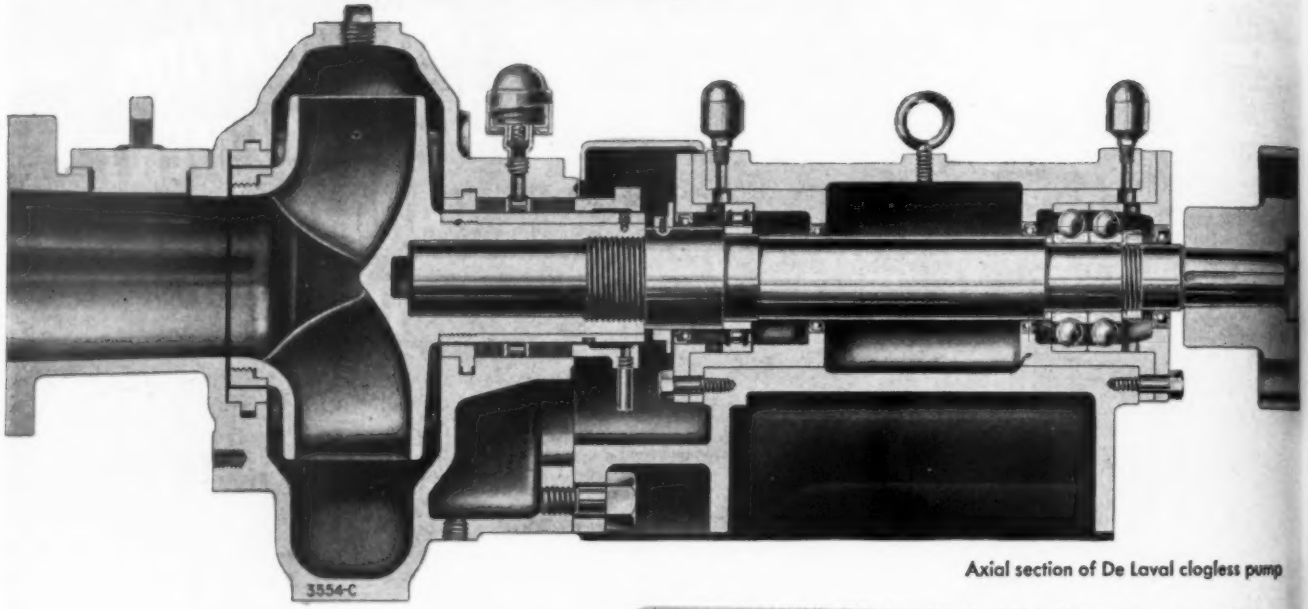
PUMPING · SEWAGE TREATMENT · WATER PURIFICATION EQUIPMENT

RESEARCH · ENGINEERS · MANUFACTURERS · *Factory and Laboratories* · · · AURORA, ILLINOIS


COMPLETE
TECHNICAL
INFORMATION
ON EQUIPMENT
AND PLANT
DESIGN
JEFFREY
ESTABLISHED
1877

ANY SEWAGE PUMP WILL WEAR

... but a DE LAVAL NEED NEVER WEAR OUT!



Axial section of De Laval clogless pump

ALL wearing parts in a De Laval Clogless Pump are readily renewable. The pump casing is split at the center line of the shaft to give access to the interior. The efficiency of the pump can be quickly and inexpensively restored by replacing the renewable wearing rings on the impeller and in the casing. Without this De Laval feature replacement, machining or rebuilding of the impeller and re-machining of the casing would be necessary to restore original clearances.

De Laval Clogless Pumps are built for long life, and sustained efficiency. Write for Catalog P-1250.

3309

TURBINES • HELICAL GEARS • WORM GEAR SPEED REDUCERS CENTRIFUGAL PUMPS • CENTRIFUGAL BLOWERS and COMPRESSORS • IMO OIL PUMPS

DE LAVAL

STEAM TURBINE COMPANY · TRENTON 2, NEW JERSEY

SALES OFFICES: ATLANTA • BOSTON • CHARLOTTE • CHICAGO • CLEVELAND • DENVER DETROIT • DULUTH • EDMONTON • GREAT FALLS • HAVANA • HELENA • HOUSTON KANSAS CITY • LOS ANGELES • MONTREAL NEW ORLEANS • NEW YORK • PHILADELPHIA PITTSBURGH • ROCHESTER • ST. PAUL • SALT LAKE CITY • SAN FRANCISCO • SEATTLE TORONTO • TULSA • VANCOUVER • WASHINGTON, D. C. • WINNIPEG

Save Time
ON PIPE TAPPING

Do it the power way. Use an electric drill operated by a Homelite Portable Gasoline-Engine-Driven Generator to run your tapping machine. It's much easier than the old-fashioned hand method. Faster, too. You can drill and tap a main in less time, for less cost and with less trouble than any other way.

The best way to see the performance that you get with Homelite Portable Generators, Pumps and Blowers is to have a demonstration given right on an actual job. If you want a free demonstration without obligation, simply write to us. We'll have our nearest representative get in touch with you.

Homelite Corporation

Portable **PUMPS · GENERATORS · BLOWERS**

PORT CHESTER, NEW YORK

Rotovalves

by

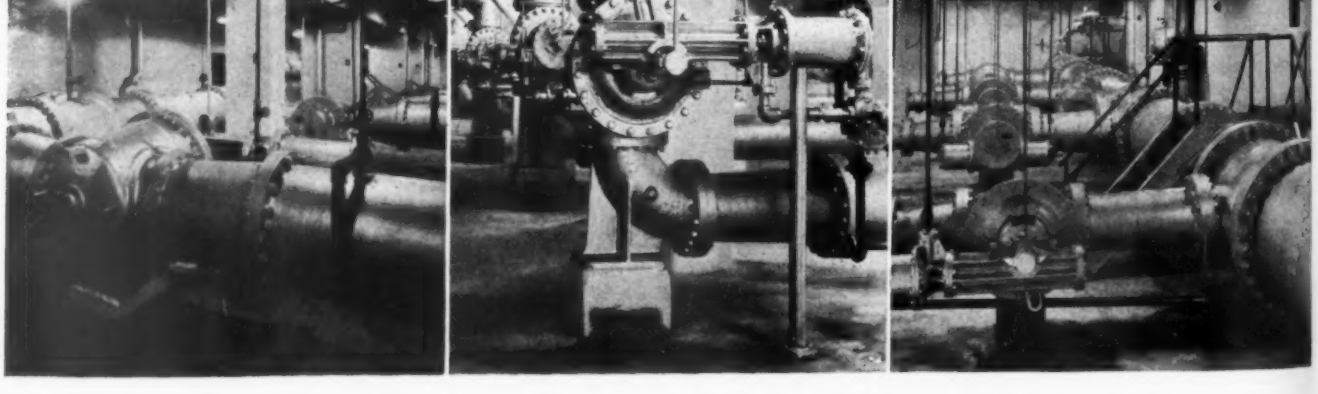
S. MORGAN SMITH COMPANY

In the Western Hills Booster Station • CINCINNATI

SETTING A STANDARD, Cincinnati's modern Station is frequently examined and studied as a "model" by interested Engineers and other Officials.

The pumping units, consisting of two 10 m.g.d., and two 7½ m.g.d. and one 5 m.g.d. pumps, are fully protected by S. Morgan Smith Rotovalves.

Among the unique features of this Station is the remote control of all valves from the operating panel.



S. MORGAN SMITH COMPANY

YORK • PA.

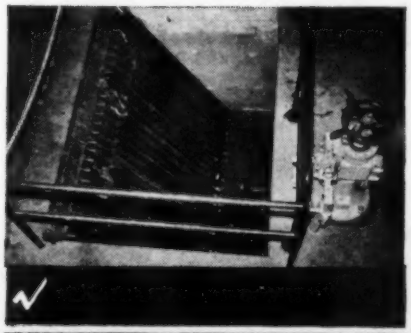
Here's how *BYERS WROUGHT IRON* helps check maintenance in checking stream pollution

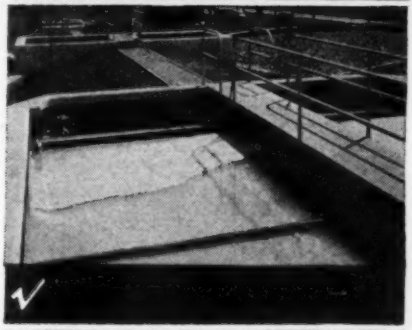
With agitation increasing for the clearing-up of streams, the near future will probably see a big increase in treatment plant construction. While the most activity will undoubtedly come from municipalities, producers of foods and beverages, textiles and tanning products, chemicals, petroleum-refinery products, rubber, paper and illuminating gas will also be concerned, as the wastes from all these operations are aggressive.

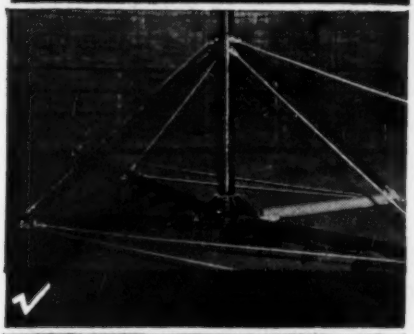
The wastes to be handled will range from active putrescible substances to oils, acids and brines, and indicated treatment may be biological decomposition, evaporation, or precipitation—with or without recovery of marketable products. There is one problem, however, that all installations will have in common, —this is corrosion, and it can be solved only by using proper materials.

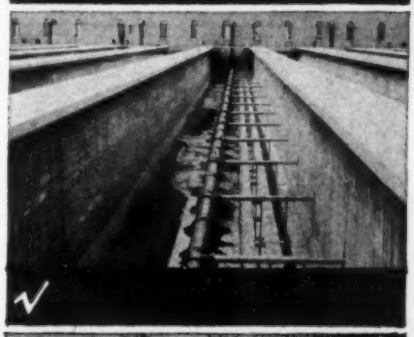
Designers who want to avoid excessive repairs and maintenance can find an excellent guide in selecting materials in existing treatment plants. The illustrations show a number of operations in modern disposal installations in which severe corrosion is encountered, and in which wrought iron has definitely proved its superior durability.

The excellent showing of wrought iron in these punishing applications is due to its unusual structure. The tiny fibers of glass-like silicate slag which are threaded through the body of high-purity iron halt and diffuse corrosive attack. They also anchor the initial protective scale, which shields the underlying metal.







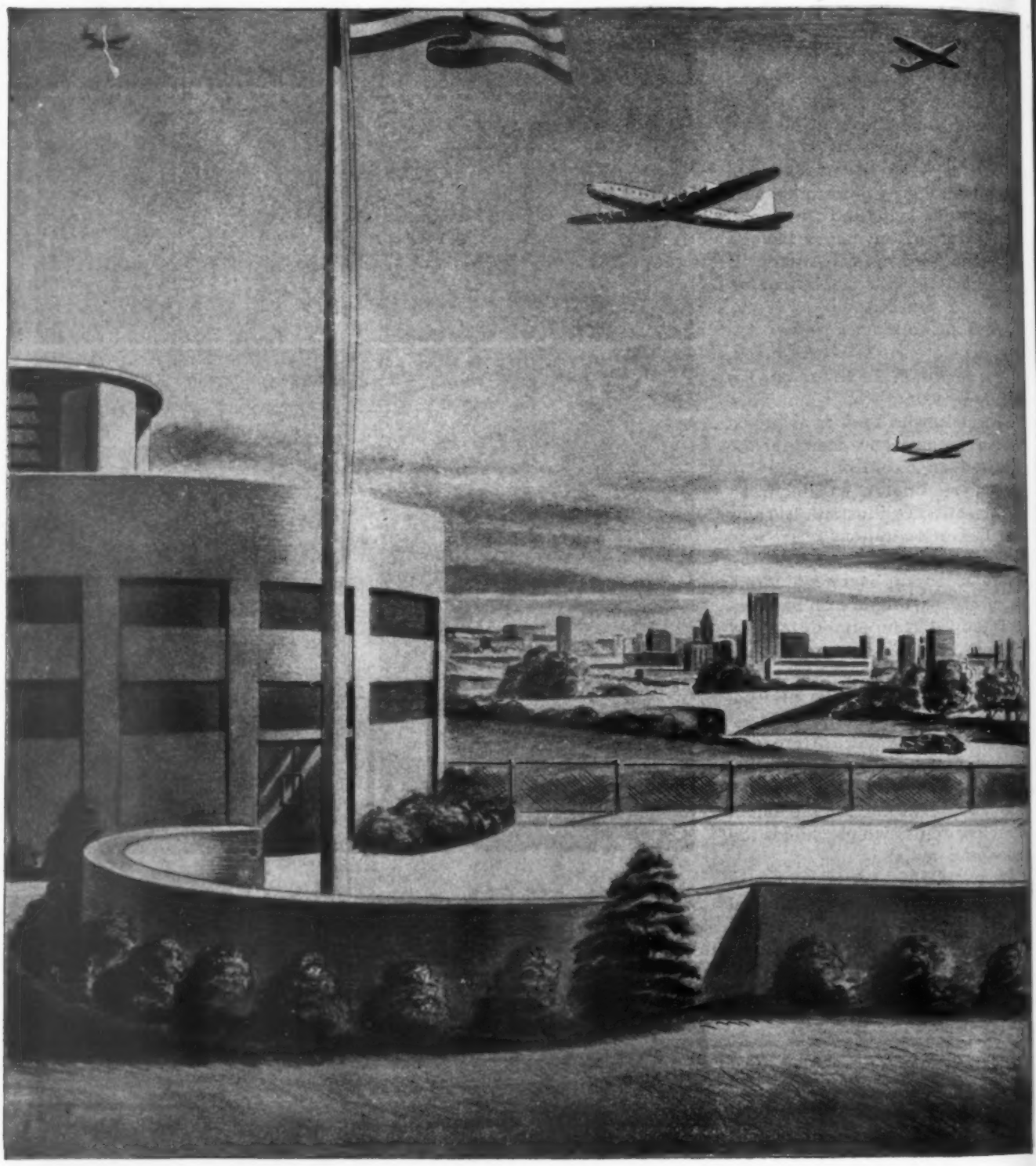


An excellent starting point in considering any plant or municipal treating problem, is to review our bulletin, "Wrought Iron for Sewage Treatment and Disposal Installations." It describes a number of modern plants, and indicates the places where engineers are successfully using wrought iron to curb maintenance. May we send you a copy?

A. M. Byers Co., Pittsburgh, Pa. Established 1864. Boston, New York, Philadelphia, Washington, Chicago, St. Louis, Houston, Seattle, San Francisco.

Corrosion costs you more than Wrought Iron

Your sewerage system can *double* its usefulness



WHAT IS a sewerage system *for?*

A fair question, we think. A basic question. A question that frequently comes up when we discuss the General Electric *Disposall* idea of instantaneous removal of fresh *food* wastes through municipal sewers.

As an expert in the field of sanitation, you are naturally interested in the *service* rendered by your facilities.

Through those facilities, you have played a great part in raising our civilization to the highest peak in history. Such once-inevitable diseases as typhoid are all but wiped out. American life expectancies are higher. American cities are more healthful, more wholesome, more pleasant to live in.

Is the Disposall idea in keeping with these objectives?

We think it is. Sewerage systems originally were developed—more than two thousand years ago—purely for *drainage* purposes. Extension of their utility to the *removal of human wastes* is largely a development of the past century.

Their further extension to the removal of *food* wastes as well, we believe, is the *next* step . . . virtually doubling the *usefulness* of your facilities in the life of your community.

There is much to be gained by this. Moreover, as the questions and answers below attest, *this extension can be brought about without affecting present sewage-disposal systems or practices.*

● QUESTIONS AND ANSWERS ABOUT INSTANTANEOUS REMOVAL OF FOOD WASTES THROUGH SEWERAGE SYSTEMS

1. What is to be gained?

Like the outmoded outhouse, the garbage can is not a desirable institution. Like the outhouse, it maintains, too near to human habitations, highly unpleasant, odorous, putrefactive, and dangerous decaying organic materials. Like the outhouse, it is a potential source of disease. Like the outhouse, it can be *eliminated* by modern plumbing, sewers, and sewage treatment!

2. How can this be done?

Sole basic distinction between human wastes at present flushed through your sewer lines, and food wastes at present removed by periodic garbage "collection," is the *solidity* of most food waste.

The General Electric DISPOSALL, *by shredding fresh food waste to a fineness capable of passing easily through sewer lines* and flushing it into the sewerage system, permits food wastes to be removed *instantaneously* and rendered harmless by standard sewage-treatment procedures.

3. Won't this create new problems and burdens for your facilities?

No. Ten years of exhaustive experimentation, supplemented by practical experience in over 300 communities, show that Disposall-shredded food wastes do not differ in any important way from present sewage.

There is no shoaling or settling or clogging of lines. Treatment plants function without change. Disposall-shredded wastes settle, digest, and react precisely as does your present sewage.

4. How about the capacity of your facilities?

Shredding and flushing of food wastes in the kitchen require less than one gallon of water per person per day.

If *every* home in your area used a Disposall, increase in sewage flow would be about *1%*. Even this small increase will be slow and gradual in coming: spread out, probably, over many years.

5. Why hasn't this been done before?

Feasibility of the Disposall idea has largely come about because *you* made it possible. Recent developments in sewage-treatment practices—for which you and the other members of your profession have worked and fought—have made the *combined* disposal of food and human wastes practicable.

This is an important advance in human welfare—the sort of welfare with which you, as an expert in municipal sanitation, are identified.

6. Can you obtain more complete information?

We hope you will! Complete data on this coming step in sanitation, and proof that it will enable you to extend the scope of your service to your community without adding new problems to your work, are available on request. We shall be glad, too, to answer any specific questions you may have. Please write to Department W.W.S.105, General Electric, Schenectady 5, New York.

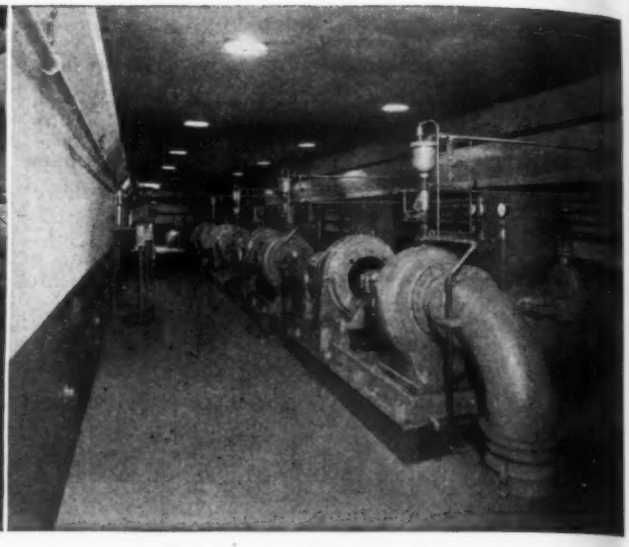
CONVERTS FOOD WASTE INTO SEWAGE—ELIMINATES "GARBAGE"

Disposall

GENERAL ELECTRIC

HANDLING 6,000,000,000 GALLONS OF SEWAGE A YEAR IN THE HAMMOND SANITARY DISTRICT

Four Worthington vertical storm water pumps at Hammond's Kennedy Avenue Station



Four Worthington horizontal 16" Mixflo pumps at Hammond's Columbia Avenue Station

To contribute to the protection of the Lake Michigan public water supply, Hammond, Indiana has done a grand job with its Sewage Treatment Works. Tied in with the Works in a comprehensive plan are several intercepting sewer systems, three outlying pumping stations, several pressure mains and the main pumping station.

Designed and constructed under the supervision of Charles H. Hurd, Consulting Engineer, Indianapolis, at a cost of $3,250,000, this plant and system handled and treated 6,375,000,000 gallons of sewage and industrial waste in 1944.

WORTHINGTON PUMPS SELECTED

Working successfully in the Hammond Sewage Treatment Works and outlying pumping stations are 11 Worthington Centrifugal Pumps as tabulated below:

NO.	SIZE	G. P. M.	T. D. H.	HP MOTOR	SERVICE	TYPE
4	24MS1	14000	10	60	Storm Water	V
1	8F1	2100	45	40	Sewage	H
1	10FG1	2800	45	50	Sewage	H
1	10FG1	3500	45	60	Sewage	H
2	16MC1	5600	35	60	Sewage	H
2	16MC1	5600	35	60	Storm Water	H

One reason why Worthington Pumps and other equipment have won their way into so many sewage treatment plants is that Worthington's diversified line permits impartial advice on the right specifications for your requirements. Ready to give you advice is an engineering staff, strategically located all over the world.

WRITE FOR BULLETIN W-313-B2

For specific information about Worthington Axial-Flow and Mixed-Flow Centrifugal Pumps as specified for the Hammond Sewage Treatment Works and other installations, write for Bulletin W-313-B2. Its sectional drawings, rating charts and useful engineering data offer strong evidence that *there's more worth in Worthington. Worthington Pump and Machinery Corporation, Harrison, New Jersey.*

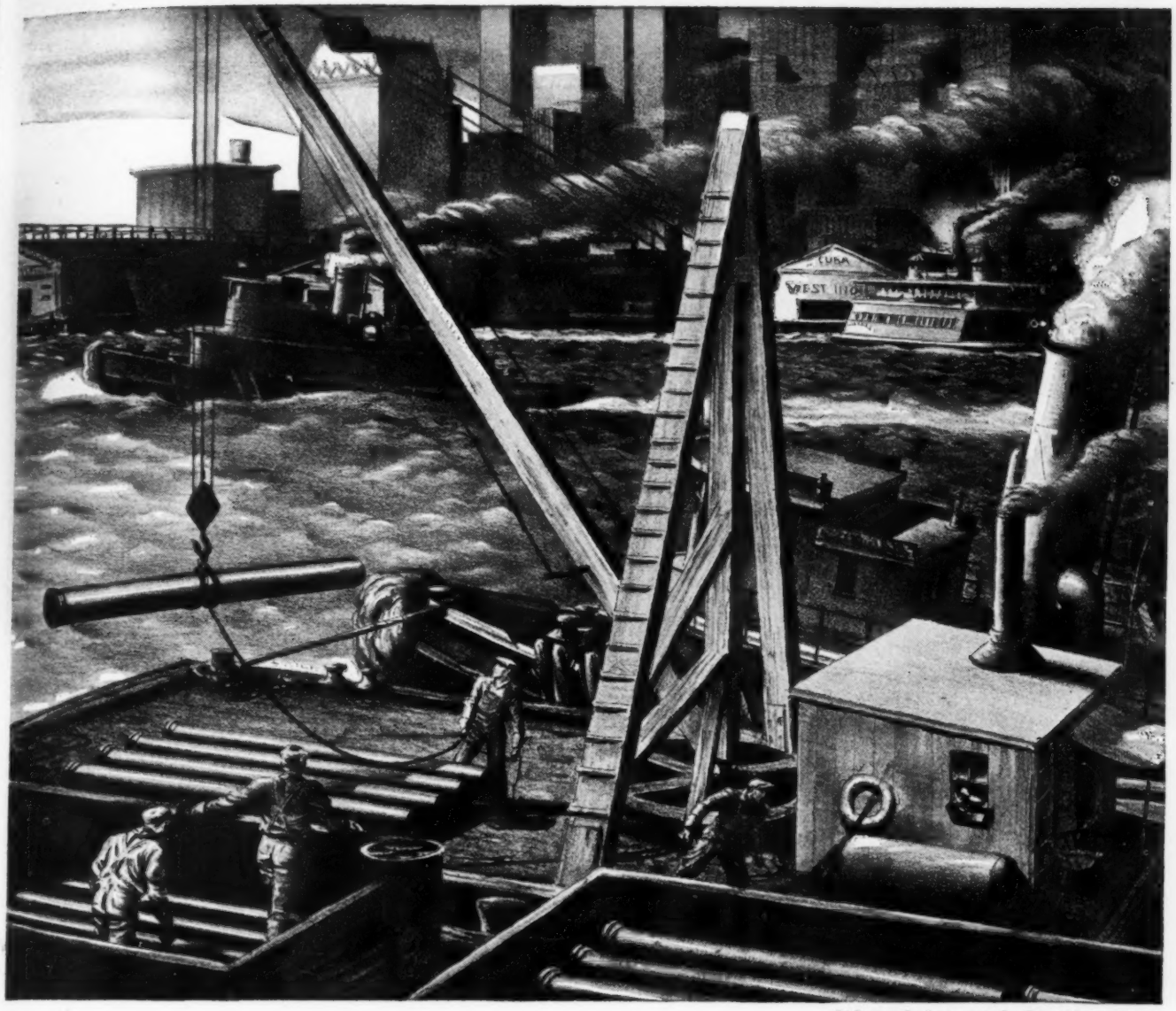
MORE JOBS GO TO WORTHINGTON

The complete line... the top engineering

Centrifugal Pumps
Diesel Sewage Gas Engines
Dual-Fuel Engines
Turbines & Turbo-Generators
Gas Engine-Compressors
Stationary Compressors
Water Softening, Filtering Equipment
Vertical Turbine Pumps
Water Meters
Power Transmission Equipment
Portable Compressors & Air Tools

WORTHINGTON

W-3



Lithographed on stone by Edward A. Wilson

By water, rail and truck, shipments of U. S. Cast Iron Pipe are once again on their way to cities and towns for peacetime projects. Our production curve is steadily on the rise and will be at peak as soon as full complements of trained personnel are again available at our several plants. The locations of these plants, and of pipe stocks carried at various points throughout the country, are advantageous for quick shipment.

U.S.
cast iron
PIPE

U. S. PIPE & FOUNDRY CO.
General Offices: Burlington, N. J.
Plants and Sales Offices throughout the U. S. A.

Back to Pre-War Quality

● General Chemical Aluminum Sulfate is back to pre-war quality . . . eliminating the emergency "war grade" product necessary during the critical period of raw material shortages.

Once again American Industry has at its command the superior standard-grade Alum of high strength and low insoluble content for which the Company has always been known. And *today, as in the past, General Chemical filter and paper makers' Alum more than meets Industry's pre-war specifications,* with its quality and purity remaining uniform—lot after lot, shipment after shipment.

This superior product is available in lump, ground, and powdered sizes from conveniently located plants and shipping points throughout the nation. . . . For immediate delivery, phone or write the nearest General Chemical Sales & Technical Service Office listed below.

BASIC CHEMICALS

GENERAL CHEMICAL COMPANY

FOR AMERICAN INDUSTRY

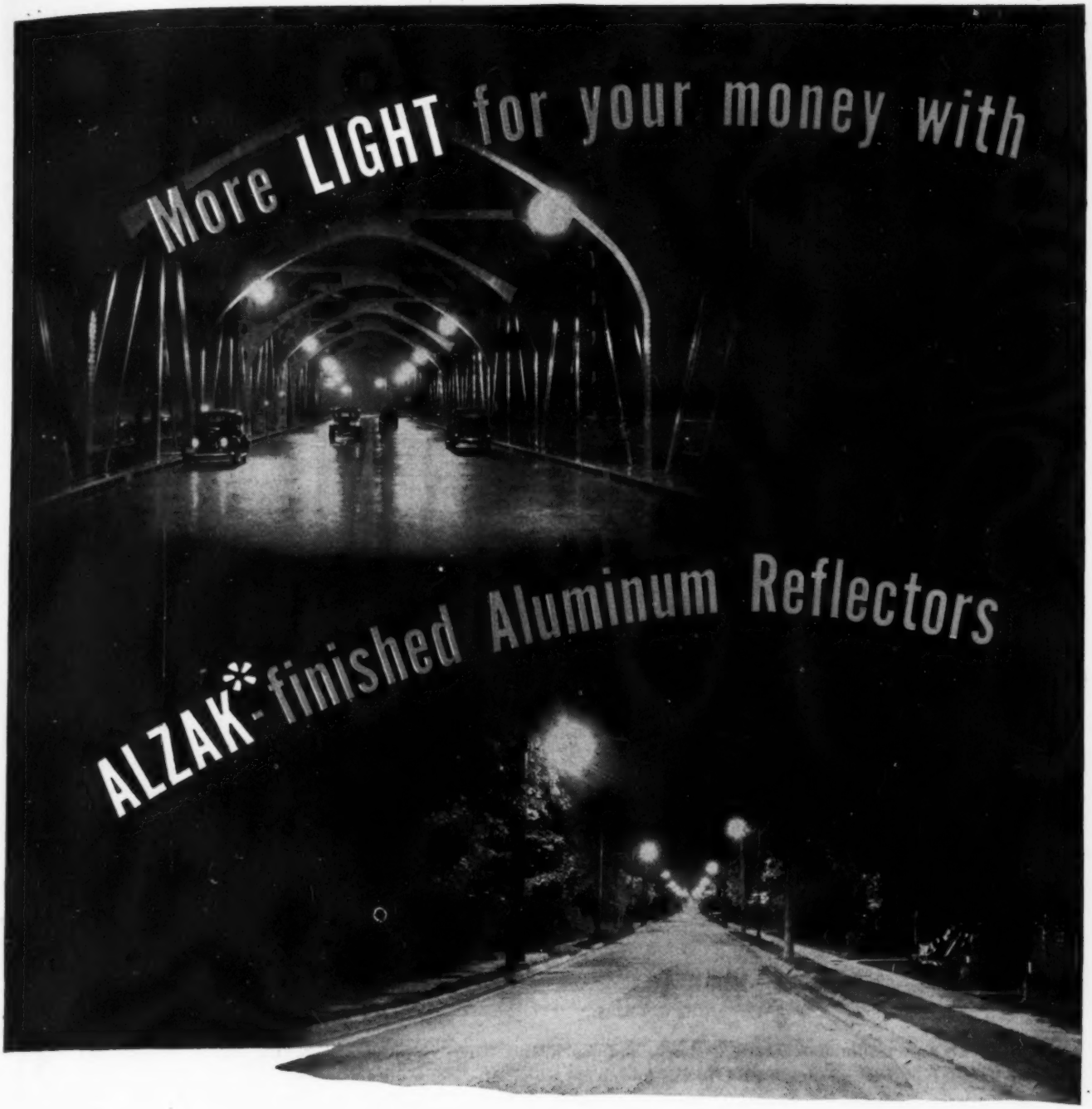
GENERAL CHEMICAL COMPANY

40 Rector Street • New York 6, N. Y.

Sales and Technical Service Offices: Atlanta • Baltimore • Boston • Bridgeport (Conn.) Buffalo • Charlotte (N. C.) • Chicago • Cleveland • Denver • Detroit • Houston • Kansas City • Los Angeles • Minneapolis • New York • Philadelphia • Pittsburgh • Providence (R. I.) San Francisco • Seattle • St. Louis • Utica (N. Y.) • Wenatchee & Yakima (Wash.)

In Wisconsin: General Chemical Wisconsin Corp., Milwaukee, Wis.

In Canada: The Nichols Chemical Company, Limited • Montreal • Toronto • Vancouver



Maximum efficiency for your lighting system, long life and low annual costs—you gain these benefits by specifying Alzak-finished Aluminum light reflectors.

The high reflectivity of Alcoa's Alzak-finished lighting sheet, in combination with the reflector manufacturers' designs, accounts for this high efficiency. The ease with which Alzak reflectors can be kept clean enables you to maintain this efficiency throughout the life of the system.

Alzak reflectors come in various finishes; for indoor and outdoor work, for spot illumination and diffuse. In ordering your reflectors, be sure to specify the type of Alzak finish for each job. Your reflector manufacturer can meet those requirements.

ALUMINUM COMPANY OF AMERICA, 1955 Gulf Building, Pittsburgh 19, Pennsylvania.

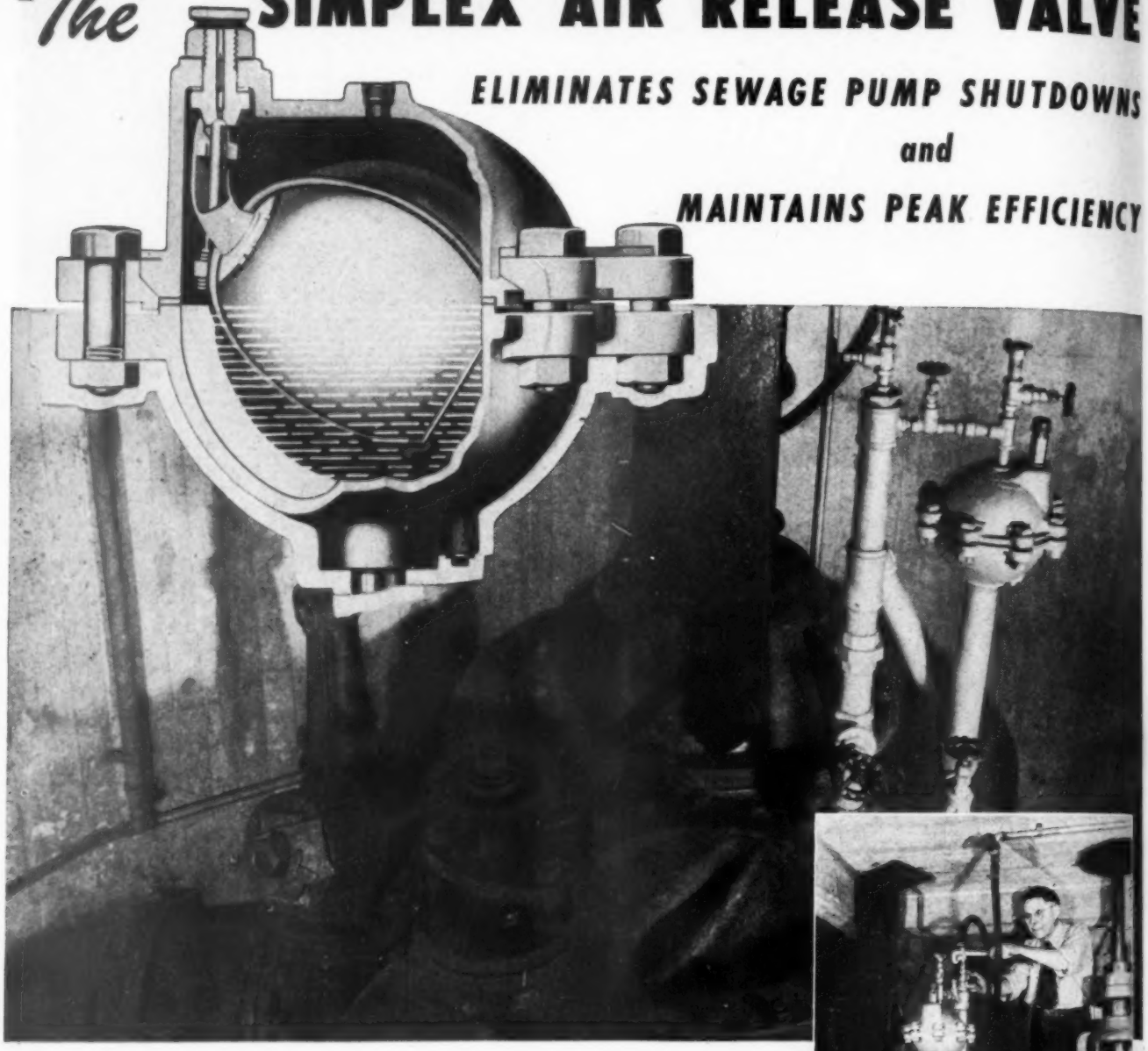
*Registered trademark

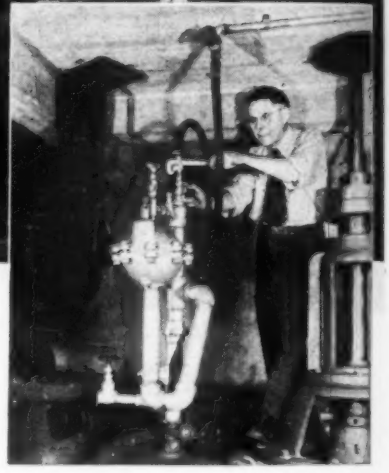
ALCOA FIRST IN ALUMINUM

ALCOA ALUMINUM

The SIMPLEX AIR RELEASE VALVE

ELIMINATES SEWAGE PUMP SHUTDOWNS and MAINTAINS PEAK EFFICIENCY





FORMERLY, complete shutdown at least once a day — now, easy routine flushing* once a week! Simplex Air Release Valves at the Pottstown Sewage Works maintain peak operating efficiency of sewage lines and pumps — eliminate frequent and costly shutdowns caused by trapped air and gases from decomposing organic matter.

Simplex Type "B" Valves are especially designed to meet the particular conditions of sewage service. Construction is simple and dependable. There is but one lever movement which operates a needle valve so designed as to be always tight-seating. The valve is operated by a heavy thickness glass ball float, tested to several times the service working pressure. A cast iron shell houses the actuating parts which are of corrosion-resisting materials.

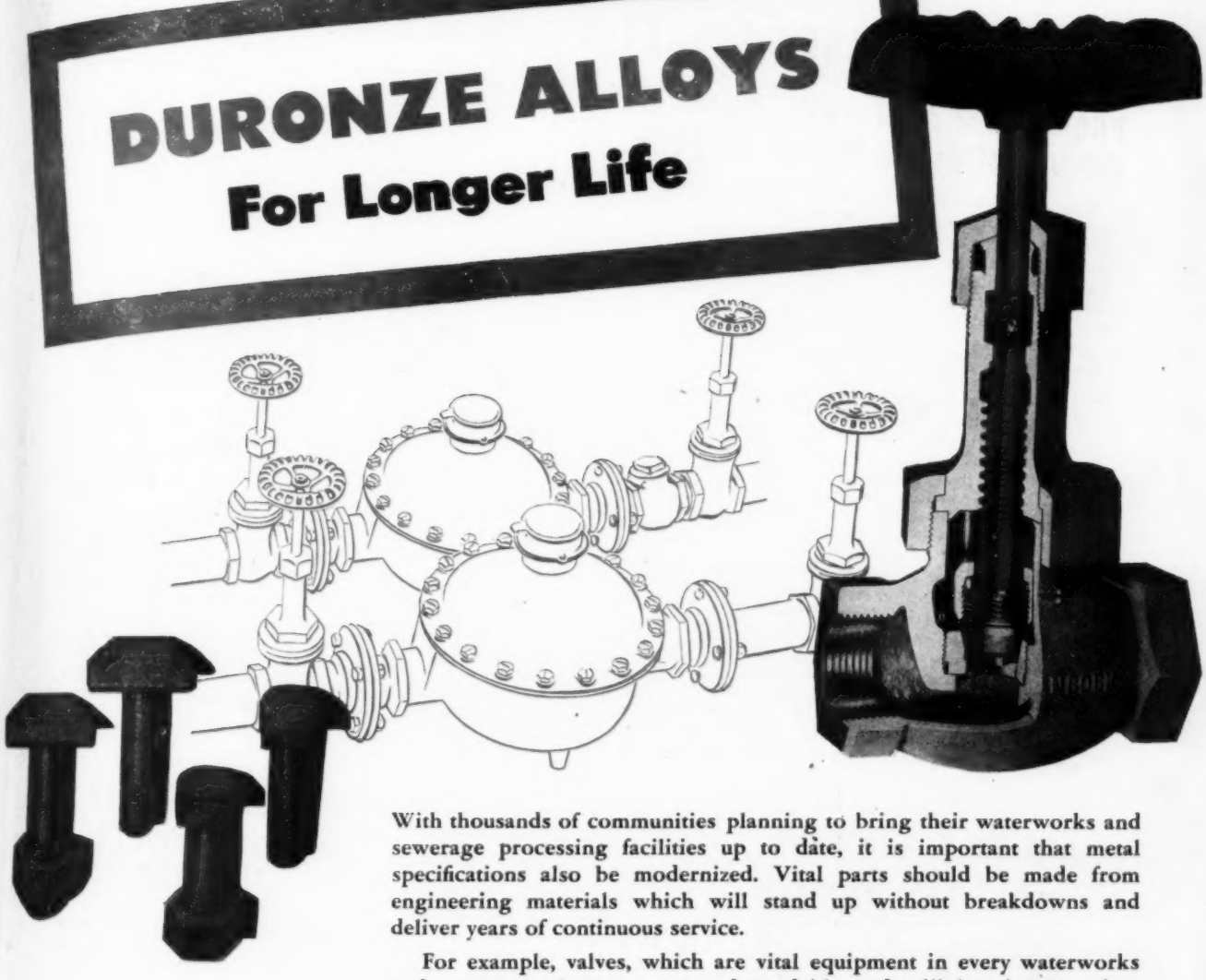
Simplex engineers will gladly assist in the solution of your sewage flow problems. Write today for details.

**Routine weekly back-flushing at Pottstown Sewage Disposal Works, Pottstown, Pa., accomplished merely by opening the valve below hose connection shown to allow clear water to fill the release valve and the system. Flush is quickly and easily completed without dismantling any part of the installation.*

SIMPLEX VALVE & METER CO.

6743 UPLAND STREET, PHILADELPHIA 42, PENNA.

DURONZE ALLOYS
For Longer Life



With thousands of communities planning to bring their waterworks and sewerage processing facilities up to date, it is important that metal specifications also be modernized. Vital parts should be made from engineering materials which will stand up without breakdowns and deliver years of continuous service.

For example, valves, which are vital equipment in every waterworks and sewerage plant, are more dependable and will last longer when stems are made from high-strength, corrosion-resistant Duronze (silicon bronze and aluminum bronze alloys).

Another place where Duronze can be used to advantage is for parts such as bolts and nuts used in the assembly of water meters and other equipment. Duronze high-strength bolts (more than 100,000 psi in tensile strength) cannot rust or freeze and can be used over and over again without deterioration.

Your nearest Bridgeport Technical Advisor will be glad to discuss the advantages of using Duronze alloys for these and many other applications in waterworks and sewerage plants. Write for 80-page Duronze Manual containing comprehensive data, suggested applications and valuable tables.

BRASS • COPPER
BRONZE • DURONZE
Strip • Rod
Wire • Tubing

"Bridgeport" BRASS

BRIDGEPORT BRASS COMPANY
BRIDGEPORT 2, CONN. • *Established 1865*

Duronze Alloys—PRODUCTS OF
BRIDGEPORT BRASS

GESS—ORIGINATORS OF SNUBBING PRINCIPLE FOR QUIETING DIESEL EXHAUSTS—BURGESS—ORIG

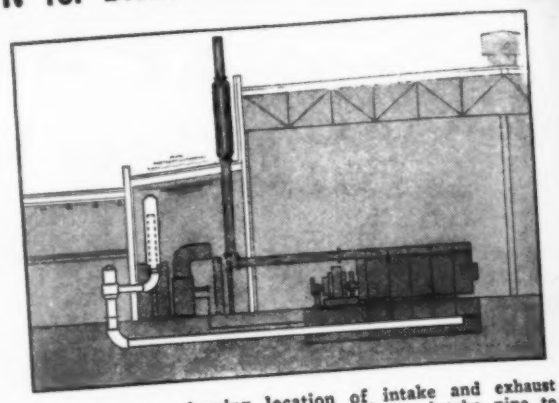
BURGESS SNUBBER BULLETIN for Diesel Exhaust Noise Control

PROPER SNUBBER POSITIONING IS IMPORTANT IN AIR INTAKE SYSTEMS

These Burgess Snubber Bulletins have, in the past, emphasized the importance of installing the Snubber in the correct position in the air intake system. For best results, the Snubber should be located near the compressor, although considerable reduction in intake surges can sometimes be attained if the Snubber is installed farther from compressor.

An interesting intake problem was created by a battery of 50 Diesel-driven reciprocating compressors in a war plant, which were installed 25 to a building. In the original installation the 20-inch intake pipe of each compressor was extended underground and brought outdoors 70 feet from the compressor. Later, the inlets were brought indoors into an adjoining low-roofed portion of the building to promote better ventilation in the engine room. With 25 compressors operating in one building, all with indoor intakes, the resulting air pulsations caused a serious roof displacement of the low-roofed section. At this point, a Burgess-Manning engineer was invited to make manometric tests and to suggest changes which would reduce the objectionable pulsations within the building.

There was no opportunity to gain access to the intake piping, most of which was buried below the concrete floor. Therefore, the only spot at which a Burgess Intake Snubber could be installed experimentally was at the inlet 70 feet from the compressor which was recognized to be a serious handicap.

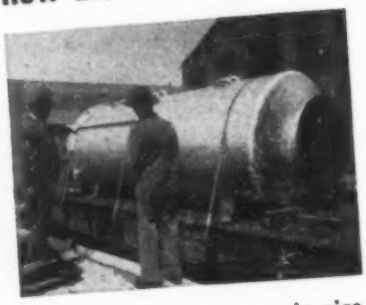


Plant diagram showing location of intake and exhaust system. Pressure surges cause roof over intake pipe to vibrate excessively.

In spite of its poor location, the Burgess Snubber reduced the surge amplitude by 60%, which, considering the small size of the building, was a marked improvement. Other local structural features, however, prevented a more comprehensive solution to this problem. The moral of this story is that the design of quiet, pulsation-free compressor intake systems is a critical engineering job and one in which Burgess-Manning engineers can give valuable advice to industrial engineers and architects. This case study also illustrates how difficult it is to undo engineering errors especially when large engines or compressors are involved.

* * *

HOW BIG IS A SNUBBER?



Burgess Snubbers vary in size from a small unit a foot and a half long to the massive 40-inch unit shown above on the flatcar. Regardless of size, the structural details of all Burgess Snubbers are alike and they all perform the same duty . . . effectively to quiet the exhaust or intake of all types of internal combustion engines, compressors, and blowers.

Standard Burgess Snubbers are available for exhaust or intake stack pipes up to 32 inches in diameter, and therefore provide suitable snubbing for all engine application.

There are many baffling engine intake and exhaust problems. For a specialized service in this field call upon Burgess engineers. Their experience in the application of gas laws and thermodynamics is valuable in developing highly efficient exhaust or intake systems.

BOOKLET "STORY OF SOUND" AVAILABLE

It is not too late to obtain your free copy of the new Burgess-Manning booklet, "A Story of Sound." Persons interested in the phenomena of sound and in the latest developments in noise abatement and sound control will want to read this booklet.

Send your request today for a copy of "A Story of Sound." Our supply is limited.

BURGESS SIDE INLET EXHAUST SNUBBER STL SERIES

With the Burgess STL Series side inlet Exhaust Snubber, the exhaust gases enter the side of the Snubber and pass out of the top. It is used on industrial engine installations which require a 10-inch or larger exhaust Snubber.

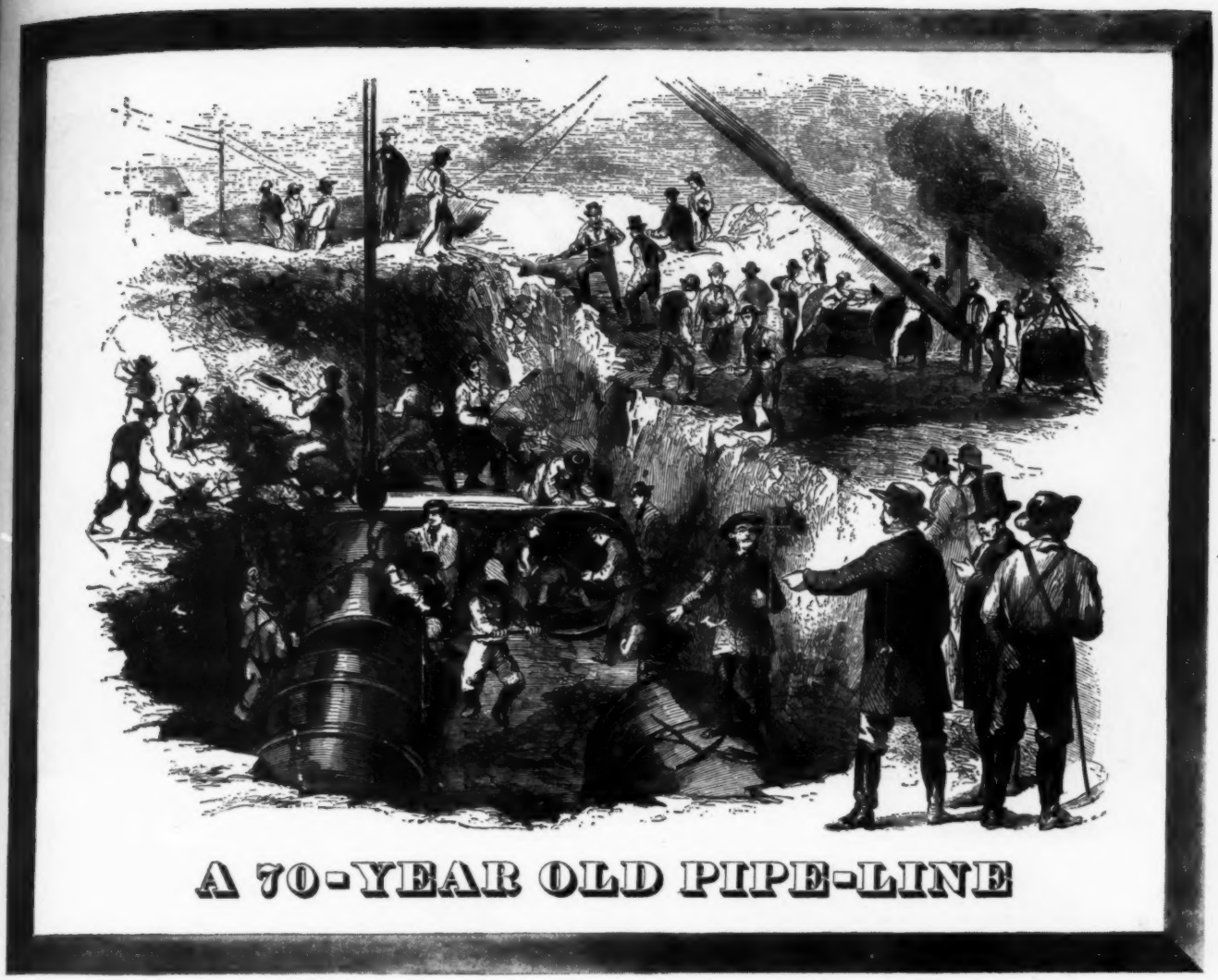
The Burgess side inlet Snubber is suited for large engines with overhead exhaust pipes. A flange provided on the base of the Snubber eliminates the need for special support brackets. This Exhaust Snubber will operate with equal efficiency whether it is located close to or far away from the engine.

Published by BURGESS-MANNING COMPANY Chicago 18, Illinois

COPYRIGHT 1945—BURGESS-MANNING COMPANY

GESS—ORIGINATORS OF SNUBBING PRINCIPLE FOR QUIETING DIESEL EXHAUSTS—BURGESS—ORIG

COMPLETE SATISFACTION IN EXHAUST AND INTAKE QUIETING—SPECIFY BURGESS SNUBBERS—FOR



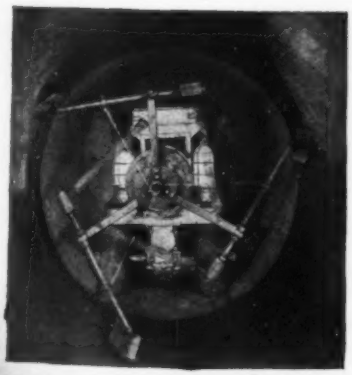
A 70-YEAR OLD PIPE-LINE

long abandoned . . . completely restored by Centriline

BACK IN THE YEAR 1874, over a hundred thousand feet of 24" and 36" wrought iron pipe were laid in the City of Rochester, New York – and continuously used until 1934. However, during the entire sixty years numerous repairs were made on this main until finally leakage became so great that this pipe-line had to be completely abandoned.

At the outbreak of the war industrial expansion in Rochester materially increased the burden of the water department. To meet this emergency and to eliminate the expense of purchasing water from outside sources, the city determined to investigate the possibility of reclaiming the important sections of this old line . . . and Centriline was called upon the scene.

After cleaning, Centriline started to apply a sleek, new cement lining on September 12th, 1944 . . . and finished the job on November 22nd – in record breaking time. Furthermore, this old pipe-line which was abandoned ten years ago has been more than satisfactorily restored – because today its carrying capacity is higher than the original coefficient.



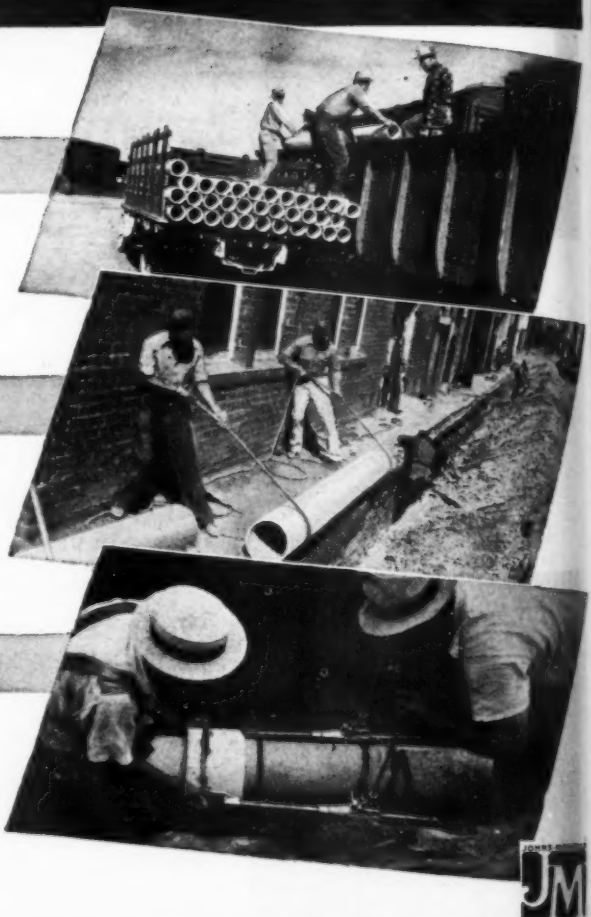
The Centriline process is a rapid and economical method of reconditioning pipelines of 30" or more. It consists of first cleaning the main and then applying by centrifugal force, a dense cement mortar lining of required thickness, mechanically troweled to a smooth finish. This is done underground, in place.

CENTRILINE CORPORATION

148 CEDAR STREET • NEW YORK 6, N. Y.

Restores and Protects Pipe-Line Carrying Capacity

Its EASY HANDLING PAYS OFF IN 3 WAYS



1. BIGGER TRUCK LOADS

Right from the start, easy-to-handle Transite Pipe begins to pay off. Its light weight means more footage carried per truck load . . . lower transportation costs.

2. SMALLER CREWS

On the job, it takes fewer men to handle Transite Pipe, and smaller installation crews mean lower installation costs. Mechanical handling equipment is not necessary except for the larger sizes.

3. FASTER ASSEMBLY

In the trench, Transite Pipe is assembled easily, quickly, even by unskilled crews. Its exclusive Simplex Coupling assures tight joints, even when the line is deflected as much as 5° at each joint.

And in service, Transite Pipe pays off in efficient, dependable water transportation. Made of asbestos and cement, this non-metallic pipe is immune to tuberculation, highly resistant to soil corrosion. Its low maintenance has been proved in thousands of installations.

Johns-Manville

22 EAST 40TH STREET, NEW YORK 16, N. Y.

TRANSITE PIPE

FOR EFFICIENT, ECONOMICAL WATER TRANSPORTATION

More Proof of the Food-Producing Value of your Sewage Sludge

The picture shows an exhibit of corn yield with and without the use of sewage sludge as a fertilizer, which appeared at the Minnesota State Fair. The exhibit represents results obtained at the State University Farm School. The sludge used was not strictly domestic sludge, which is richest in fertilizing elements, as the local sewers carry storm and industrial, as well as sanitary, sewage. However, the increased crop yield is readily apparent.

Greater American food production was never so urgently needed as it is today. Burning or burying sewage sludge has no place in this abnormally hungry world. Your sludge should be at work increasing food crops—it contains abundant fertilizing values. True, the sludge cake as it comes from your drying beds is not in condition for effective use as a fertilizer. But you can easily make it so, and at the same time obtain a steady revenue, with the Royer Sludge Disintegrator.

One man operates this rugged, inexpensive machine. All he does is shovel the sludge cake into the hopper. The Royer shreds, mixes, aerates and further dries the sludge. At the same time, it removes trash and reduces the sludge to small particles, readily assimilable by the soil. The machine discharges onto pile or truck an effective and ready-to-use fertilizer, for which there is an ample market everywhere.

Royers are available in twelve models—electric motor, gasoline engine or belt-to-tractor driven. Sizes for every sewage plant.

Take the first step toward obtaining profits from your sludge beds by writing for the Royer "Sewage Sludge Utilization Datalog."

ROYER

PIONEERS IN THE SALVAGE OF SEWAGE SLUDGE

ROYER FOUNDRY & MACHINE CO.

170 PRINGLE ST., KINGSTON, PA.

HAVING LOTS OF CHILDREN IS A MATTER OF KNOWING JUST WHAT TO DO!

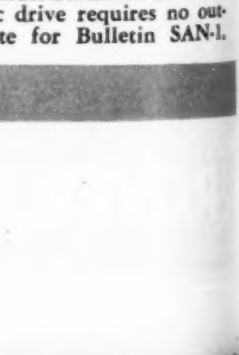
%PROPORTIONEERS%

HAVE FATHERED WELL OVER 18,000 INSTALLATIONS AND ARE STILL GOING STRONG

Making the best chemical feeding equipment available at a reasonable price is the secret of %Proportioneers% success. Many %Proportioneers% pumps have been in continuous service over ten years, feeding all water treating chemicals accurately and economically. There's a %Proportioneers% especially designed for your particular conditions, whether the water supply is pumped or gravity flow, high or low pressure; models are available for constant rate, flow-responsive or time-responsive operation. Write for information.

TYPICAL MEMBERS OF %PROPORTIONEERS% FAMILY:—

HEAVY DUTY CHEM-O-FEEDER



Feeds all chemicals up to 7 g.p.h. with feeding rate instantly adjustable while the pump is operating. Low in cost and simple to install; it requires no skilled operator. Bulletin SAN-2 on request.

AUTOMATIC AND PROPORTIONAL CHEM-O-FEEDER

Controlled by standard water meter it automatically feeds chemical in pace with changing flow rate, preventing dangerous undertreatment or wasteful overtreatment. Hydraulic drive requires no outside source of power. Write for Bulletin SAN-1.

% PROPORTIONEERS, INC.%

9N CODDING ST., PROVIDENCE 1, R. I.

WATER WORKS & SEWERAGE

PUBLICATION OFFICE
330 South Wells Street, Chicago, Ill.
E. S. Gillette, Publisher

EDITORIAL OFFICE
155 East 44th Street, New York, N. Y.
L. H. Enslow, Editor

COMING!

Treating Mine Water for Domestic Use

Is an article describing the modern water treatment plant and method of treatment employed in producing a domestic water supply in a plant which is perhaps at the highest elevation of any water treatment plant in the world. The authors are—

ROBT. WAMSLEY and W. E. JONES,
Climax Molybdenum Co., Climax, Colo.

Good Operators Don't Work!

Is an intriguing title for an article that bids fair to give many sewage works operators something to think about. Most of us have at one time or another "tried everything in the book" and followed every bit of expert advice offered in trying to make a sewage plant behave as it should—to find our reward to be only disappointment. When the supervisor of one plant "decided to let the thing go dirty" he was in for a great surprise—and, in so doing discovered that Nature still has a way of taking care of itself. In the course of events and observations something of considerable value was learned concerning the most effective operation of the lowly primary tanks, and the marked effect therefrom on the activated sludge process and performance of the entire plant. The author is—

CHAS. H. CAROTHERS,
Consulting Bio-Chemist, Miami, Fla.

Trickling Filter Operation and Results

Is a three-part treatise on the interpretation of single and two-stage high capacity trickling filter results and the chief causes of poor results. This exhaustive study, with particular reference to "Aero-filters," has been made by—

J. A. MONTGOMERY, Chief Engineer,
Lakeside Engineering Co., Chicago.

The Disposal of Industrial Wastes

Is a broad view of the problems, the classification, the source, and the economics of modern industrial wastes, as well as a discussion of pollution abatement programs, industrial waste surveys, methods of paying for industrial waste treatment, the question of by-product recovery, industrial cooperation, and the future of waste treatment. The author is—

DR. GEORGE E. SYMONS, Assoc. Editor,
Water Works & Sewerage.

Orifices—Their Selection and Use

This contribution was promised several months ago. Inasmuch as it turned out to be a veritable treatise on the subject, and inasmuch as the paper use restrictions became worse rather than better, we have so far been unable to print this valuable material which we are reluctant to split into two or more parts for publication. We merely wish our readers and the author to know what has delayed publication. Those who are acquainted with his earlier productions we know are anxious to have this reference work (a veritable handbook on "Orifices") by—

D. R. TAYLOR, Major,
Corps of Engineers, U. S. Army.
(Formerly Supt., Roanoke, Va., Water Dept.)

Build Your Own—Solution Feed Control

Is another in a series of successful gadgets developed at the Baltimore Filtration Plant. The describer is—

A. A. BAILEY, Filtration Engr.,
Montebello Filters, Baltimore, Md.

A Modernized Method of Financing Water Main Extensions

Explains why and how the Water Department of a moderate sized community of 21,500 population has set up a new method for financing water main extensions into new real-estate developments, and also for financing main extensions in general. The author is—

WILLIAM P. MELLEY,
Sup't of Water, Milton, Mass.

VOL. 92, NO. 11 — NOVEMBER, 1945

CONTENTS

Operation of Activated Sludge Plants 311
By Gail P. Edwards, Ph.D.,
Chief of Laboratories, Dept. of Public Works,
New York, New York.

Sewage Works Federation Board Actions 317

Centrifugal Pump Peculiarities 321
By Robert W. Angus, Cons. Engineer,
Toronto, Ontario, Canada.

NEWWA's 64th Annual Meeting 325

Maine Water Association Meets in Bath 329

Water Treatment to Reduce Chemical Odors 331
By Lawson Haynes, Plant Supt., and
Wallace Grant, Chemist,
West Virginia Water Service Co.,
Charleston, West Virginia.

Sixth Annual Meeting Western Penna. Section AWWA 335

Michigan Section AWWA and Michigan Conference Hold Joint Meeting 339
As reported by Harry A. Faber,
Editorial Associate.

N. E. Sewage Works Association Fall Meeting 342

Some Problems and Considerations in Open Channel Flow Measurement 345
By R. E. Sprenkle, Hydraulic Engineer,
Bailey Meter Co.,
Cleveland, Ohio

Flow and Depth in Trapezoidal Channels 350
By Paul McH. Albert,
Shoecraft, Drury, and McNamee, Engrs.,
Ann Arbor, Michigan

Editorial 352

Meetings Scheduled ..... Ad. Page 94

Here and There with "Doc" Symons 96

"The Spillway" ..... Ad. Page 104

Manufacturers' and Equipment News 117

Literature and Catalogs Received 129

H. P. Gillette, Pres.; E. S. Gillette, Vice Pres. and Publisher; L. H. Enslow, Vice Pres. and Editor; J. C. Black, Mgn. Editor; George E. Symons, Associate Editor; Editorial Associates—J. R. Baylis, A. M. Rawn, H. A. Faber; H. J. Conway, Adv. Editor; L. D. Sanders, Make-Up Editor. *Chicago Office*, Norman T. Burke, Rep., 330 S. Wells Street; *Cleveland Office*, Lee B. McMahon, Mgr., Leader Bldg.; *New York Office*, J. M. Angell, Jr., Mgr., 155 East 44th Street; *Los Angeles Office*, Don Harway, Rep., 816 W. Fifth Street.
Water Works & Sewerage is a monthly publication. Single Copies, 25 Cents; Subscription Rates U. S. and Canada, $2.00 per year; Foreign, $3.00 per year.

TRIDENT *Interchangeability* MEANS EFFICIENCY IN MAINTENANCE

"TRIDENT METERS ARE EASIER TO REPAIR"

"It is a pleasure for me to inform you that, even tho' I am without eyesight, I have worked in the Meter Shops for Salt Lake City for a little over six years and that I find it easier to repair TRIDENT Water Meters than any other make with which we come in contact."

Statement by MR. HUBERT COCHRAN Salt Lake City Meter Shops

EFFICIENCY experts will tell you that lost motion is one of the major causes of inefficiency. An example of this, in a meter shop, is the time and effort spent in finding the proper repair parts, and scraping and fitting them at the bench.

Interchangeability is the cure for both these ills; and you get it in Trident Meters. Standard new parts fit all casings, new or old, perfectly.

NEPTUNE METER COMPANY • 50 West 50th Street • New York 20, N. Y.

Branch Offices in CHICAGO, SAN FRANCISCO, LOS ANGELES, PORTLAND, ORE., DENVER, DALLAS, KANSAS CITY, LOUISVILLE, ATLANTA, BOSTON.
Neptune Meters, Ltd., Long Branch Ont., Canada

133

WATER WORKS & SEWERAGE

VOL. 92, No. 11 *A Gillette Publication* NOVEMBER, 1945

OPERATION OF ACTIVATED SLUDGE PLANTS*

By GAIL P. EDWARDS, Ph.D.
Chief of Laboratories
DEPARTMENT OF PUBLIC WORKS
CITY OF NEW YORK

THE activated sludge process is widely used where a high degree of purification is required. It may be operated with complete freedom from odors and flies, on a minimum area of land. Pearse reported that at the end of 1942, there were 386 plants in the United States.

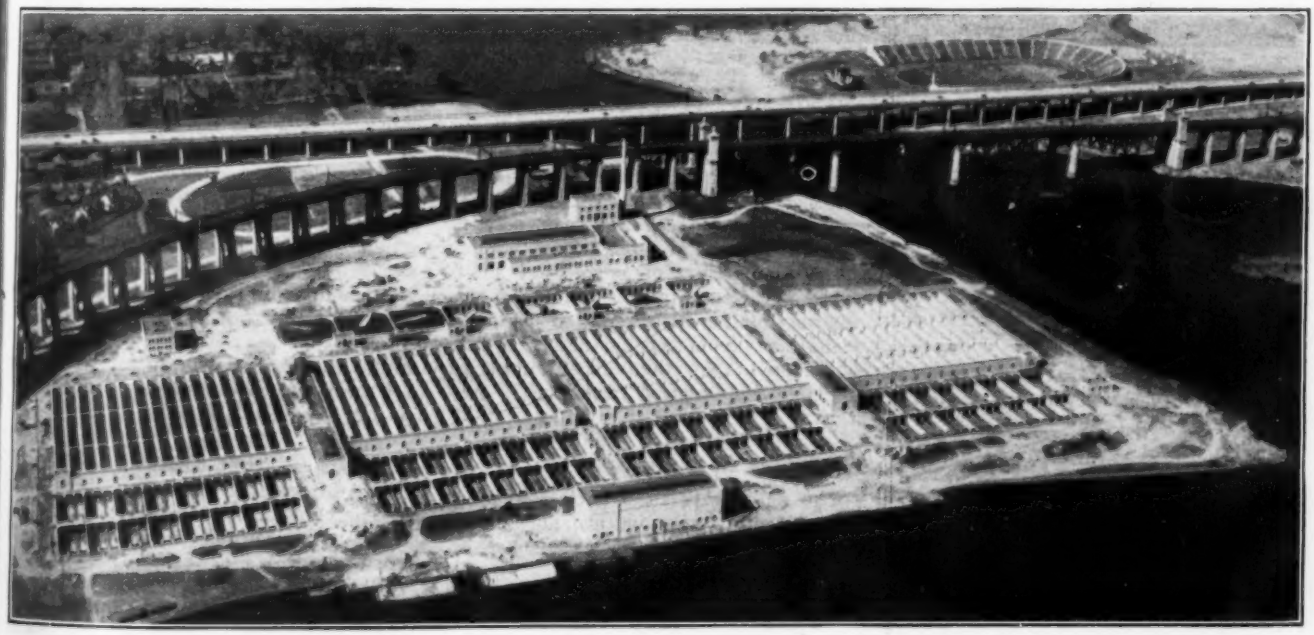
The Author

Theory

In nature, the decomposition of organic wastes is accomplished by the activities of bacteria and other micro-organisms which use complex organic materials as food and break them down into simple, more stable forms. The organic substances contained in sewage form a bountiful food supply for the micro-organisms. When sewage flows over or comes in contact with a suitable surface, growths of bacteria and micro-organisms appear and soon cover the surface with a slimy gelatinous film. This film, which is full of life, has the extraordinary power of first attracting to itself substances that previously had been held in suspension, colloidal state, or even in solution; then of removing from these attracted substances, the food necessary for film maintenance and growth; and finally of returning to the sewage, the end products of decomposition.

The activated sludge process is a method of sewage purification consisting of the aeration of sewage in the presence of biologically active sludge which has previously been produced by the process. It is a true biological contact process. The solids suspended in the sewage form the initial nucleus or contact surface to which the slime forming biological growths adhere. Large flocs of suspended matter are formed by bacterial growth. By voracious feeding, the organisms in the floc cleanse or restore the active con-

* A paper presented at the Lecture-Laboratory Course on Sewage Treatment at St. Joseph's College, Philadelphia, Pa.



Wards Island Sewage Treatment Plant, New York City (Diffused Aeration)

(An article intended for our strike-bound October issue.)

tact surfaces; hence they are called "activated" sludge flocs. This floc contains living, growing organisms which require oxygen for life.

Activated sludge, as defined by Donaldson, is a brownish gelatinous material consisting mainly of micro-organisms produced during the continued aeration of sewage. A flow diagram of a simple activated sludge plant is shown in the accompanying diagram.

In practice, the sewage mixed with returned activated sludge flows through aeration tanks where air is added. From the aeration tanks, the effluent discharges into final settling tanks where the activated sludge settles out. Most of the sludge is returned to the aeration tanks to inocculate the sewage. The effluent from the final settling tanks is clear, free from color and odorless.

Aeration may be accomplished in several ways:

1. Diffused air aeration: Air is blown into the sewage as it flows through the tanks.
2. Mechanical aeration: Mechanical apparatus is employed to aerate the sewage and keep the solids in suspension. Absorption of air takes place at the surface of the liquid.
3. Combined use of diffused air and mechanical aeration: A reduced amount of air is blown into the sewage while mechanical apparatus keeps the liquid in circulation.

The material in this paper applies particularly to diffused air plants.

Starting Units in Operation

Before placing units in operation, tanks and pipe lines must be free of debris and all mechanical equipment in working order.

The most common method of starting an activated sludge plant in operation is by the continuous flow method. The sewage is allowed to flow through the tanks continuously and all sludge from the final tanks is returned to the aerators. Some purification will be obtained in a few days, but from one to three weeks are generally necessary to produce normal purification. When the concentration of suspended solids in the aeration tank has reached a satisfactory value, excess sludge should be withdrawn from the system at a rate which will keep the concentration of solids in the aeration tanks fairly constant.

Variables in Operation

The most important variables under the control of the operator of an activated sludge plant are:

1. Volume of air applied.
2. Concentration of suspended solids in aeration tank.
3. Aeration period.
4. Rate of sludge return.
5. Condition of the sludge.

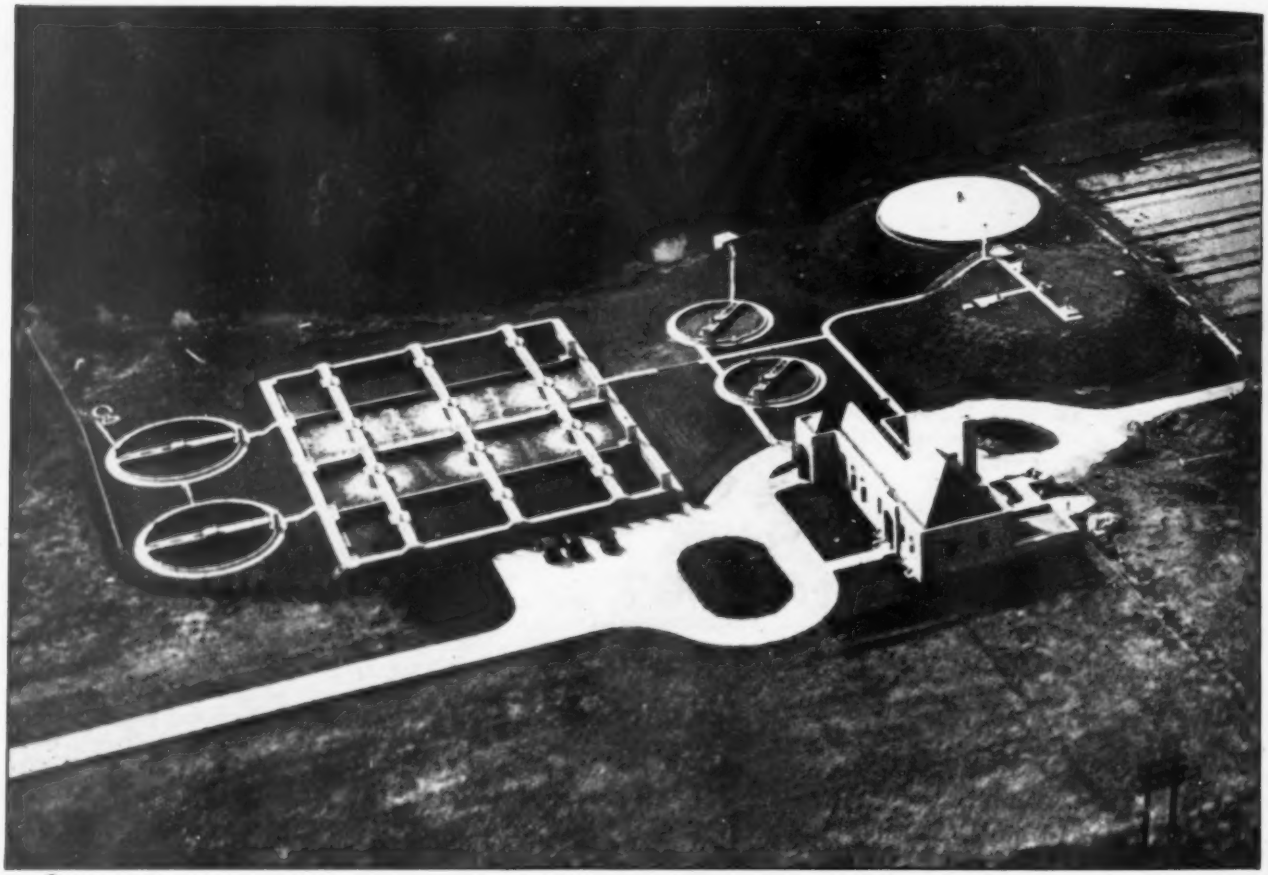
Operating data from several activated sludge plants are shown in Table I.

These variable factors must be properly controlled according to local conditions and changed as necessary to meet seasonal variations and fluctuations in load. They depend upon each other and a change in one will generally require changes in some of the others.

Volume of Air Applied: The volume of air applied is important not only as far as treatment is concerned but also because it determines the cost for power. In diffused air plants, the air is used to keep the solids in suspension, to obtain thorough mixing, and to supply oxygen for the microscopic organisms. It is essential to maintain aerobic conditions throughout the system (aeration and final settling tanks) for best operation. It is wasteful to use more air than necessary and injurious to treatment to use less than the required amount.

The average amount of air used varies from about 0.30 to 2.0 cu.ft. per gallon of sewage. These values depend on the concentration of aeration solids, the aeration period, and the strength of sewage.

The quantity of air used is sometimes expressed in cu. ft. per pound of BOD. removed. This method of expression has the advantage of showing the work



Elmhurst, Ill., Sewage Treatment Plant (Mechanical Aeration)

done or the efficiency of the use of the air. As shown in Table I, values may range from about 350 to about 2200 cu. ft. of air per pound of 5 day BOD. removed. In comparing data from various plants, it is important to note that economy in use of air may not be important at plants where air compressors are operated by sludge gas engines.

The amount of air used is generally controlled by determinations of dissolved oxygen from one or more points in the aeration or final tanks. Some operators determine the dissolved oxygen content at the inlet and midpoint as well as at the outlet end of the aeration tanks. Others control the air from samples taken in the final tanks. Generally the dissolved oxygen is lowest near the influent end of an aeration tank and it increases gradually to the effluent end. A dissolved oxygen content of 2.0 — 5.0 ppm. is generally required at the outlet end of the aeration tanks in order to maintain aerobic conditions throughout the tanks.

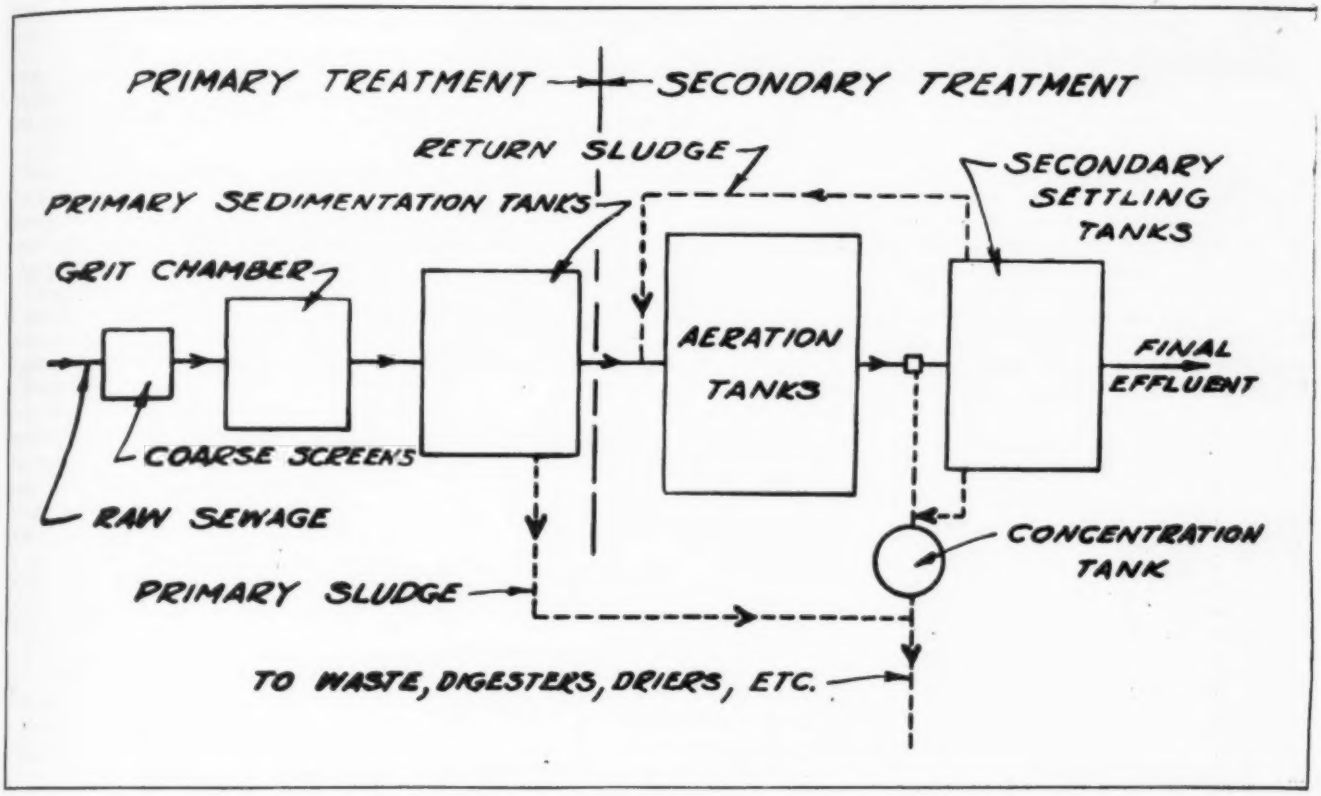
In the activated sludge process, the entire load of sewage is normally added to the return sludge in a single dose at the inlet end of the aeration tanks. Consequently, the demand for oxygen is very high there. This demand for oxygen decreases as the sewage passes through the tank, reaching a minimum at the outlet end. In order to meet this high initial demand for oxygen, it has been proposed to add the largest amount of air at the inlet end and gradually decrease it toward the outlet. This method, called "tapered aeration," is being used at a number of plants.

Gould has suggested that instead of tapering the air, adding the sewage to the returned sludge in steps would even out the demand for oxygen throughout the aeration tanks. In New York City, he has provided for the addition of sewage to the returned sludge at three points in the aeration tanks. This process is called "step aeration".

Concentration of Suspended Solids in Aeration Tanks: The control of the concentration of suspended solids in aeration tanks is one of the most important factors in operation. As shown in Table I, the concentration varies considerably with the individual plant, ranging between 500 and 3500 ppm. with values between 1500 and 2500 ppm. most common. There is no single optimum for all plants. In general, no more solids should be used than are needed to properly purify the sewage.

The concentration of suspended solids which should be maintained in the aeration tanks seems to be related to the volatile solids in the sewage. There is some evidence to show that if the percentage of volatile solids is high, the concentration of solids in the aeration tanks should be low since sludge with a high volatile content is bulkier and settles less readily than one with a high ash content and may therefore yield a poorer effluent.

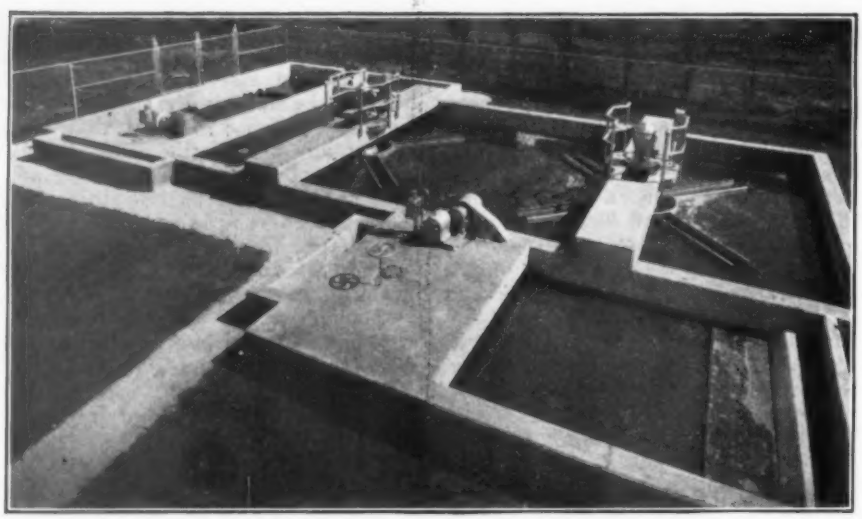
Sludge with a high percentage of volatile matter is apt to be more active biologically than one with low volatile solids and if the total suspended solids in the aeration tanks are high, it may be difficult to maintain aerobic conditions especially in the summer months. Conversely, with lower volatile solids, higher concentration of solids may be carried in the aeration tanks.



Flow Sheet—Activated Sludge Process

TABLE I

PLANT	Sewage Flow mgd.	AIR: Cu. ft. Gal.	AIR: Cu. ft. per Pound of BOD. Removed	Suspended Solids Aeration Tank-ppm.	Aeration Period Hours	RETURN SLUDGE: Per Cent of Sewage Flow	RETURN SLUDGE: Suspended Solids %	SLUDGE INDEX: S. D. I.	SLUDGE INDEX: S. V. I.
Chicago, Calumet ...	82.4	0.35	500	2,860	4.0	22.4	1.55	1.93	52
Chicago, North Side.	196.	0.42	462	2,500	5.4	22.4	1.31	1.27	79
Cleveland, Easterly .	91.3	1.10	1,420	2,240	6.6	20.9	1.11	1.35	74
Findlay, Ohio	2.295	0.69	840	1,420	5.5	25.9	0.51	0.66	151
Ft. Wayne, Ind.....	17.6	0.99	835	2,320	8.6	27.	0.97	0.90	111
Gary, Ind.	21.5	0.41	910	1,350	3.9	32.5	0.45	0.98	102
Jackson, Mich.	9.15	0.60	650	3,020	..	15.	...	2.86	35
Marion, Ohio	3.76	0.62	907	3,000	4.0	31.9	1.08	1.75	57
Muskegon Hts., Mich.	1.18	0.47	345	900	6.3	41.1	0.43	1.0	100
New York, Wards Is.	184.	0.57	470	1,770	4.5	45.	0.48	0.59	170
Pasadena, Tri-City .	9.63	1.73	1,450	1,100	6.9	12.	0.67	0.53	189
Rockville Center, N. Y.	1.99	2.0	2,180	740	5.0	3.5	2.70	2.63	38
Springfield, Ill.	9.2	0.64	950	1,580	5.45	28.	0.42	1.03	97



Mechanical Aerators at McHenry, Ill., Sewage Treatment Plant

Within an individual plant, the concentration of solids may vary 500-1000 ppm. from time to time. Sometimes this variation is intentional because of seasonal or special operating conditions. Sometimes, it is unintentional, as for example, a concentration of suspended solids, much higher than usual may be caused by heavy storms or by the necessity of temporarily storing sludge in the system.

Aeration Period: The aeration period may usually be varied only within very narrow limits unless extra tank capacity is available. When several aeration tanks are in use, one or more of them may be removed from service in order to reduce the detention period in the others. In practice, the most common aeration period is 4-6 hours.

Long periods usually produce a high degree of purification with oxidation of nitrogen to nitrates. Since high nitrates stimulate the growth of algae and other aquatic plants, they may be undesirable in the outlet water course. With long aeration periods, however, the activated sludge process is less upset by shock loads and the plant is easier to operate. With short aeration periods, the process is more sensitive to sudden change and the plant is more difficult to operate.

Rate of Sludge Return: The rate of sludge return is usually expressed as a percentage of the sewage flow. For example, if the sewage flow is 10 mgd. and the return sludge rate is 25 per cent, the volume of return sludge would be 2.5 mgd. and the total volume passing through the aeration tank would be 12.5 mgd. Usually the sludge return rate varies from 20 to 45 percent.

The concentration of solids in the aeration tank is controlled by the amount of excess sludge drawn off for disposal or wasting. Within limits, the rate of sludge return is not usually important as a high rate means thin sludge returned and a low rate means a heavy sludge. It is the pounds of solids returned to the aeration tank, which must be controlled, rather than the volume.

It is very important, however, to keep the solids fresh and the return rate should be high enough to avoid stale sludge. Returning sludge at a rate higher than the scrapers can bring it to the sump may mean circulation of aeration liquor. At Wards Island, where excess sludge is concentrated in separate tanks, the final tanks are kept as free from settled sludge as possible. Final settling tanks should not be used for sludge storage.

Condition of the Sludge: The condition of the sludge which reflects the success of the operator in controlling the environment is generally determined by its appearance and odor, settling characteristics and by microscopic examinations.

Fresh, well-conditioned activated sludge is brownish in color turning black as it becomes septic. It normally has a characteristic musty odor when fresh but becomes foul and sour when allowed to stand in the absence of air. The floc of good quality sludge is moderate in size and the water surrounding it on settling is clear and colorless.

The settling characteristics of sludge have considerable value in controlling operation and may be expressed in several ways. Theriault in 1920 called attention to the value of the "sludge ratio" as determined by dividing the parts per million of suspended solids in the aeration tank by the volume in milliliters occupied by the sludge after settling one liter of liquor for a period of 15 and 30 minutes. No single time was proposed and little or no practical use was made of the suggestion in the operation of activated sludge plants. Donaldson in 1931 proposed the "sludge index" for a practical routine test and computed it by dividing the percentage of aeration tank suspended solids by weight times 100 by the volume of sludge settled in 30 minutes, also expressed in per cent. Sludge index values above 1.0 were considered satisfactory for normal operation. Later experience has shown that some plants, such as Wards Island, may operate satisfactorily with an index as low as 0.50. In 1934, Mohlman proposed that the sludge index be defined as the volume in milliliters occupied by one gram of sludge after 30 minutes' settling and calculated by dividing the volume of sludge in per cent after 30 minutes' settling by the weight of suspended solids in per cent. With this index, values less than 100 are considered satisfactory. The Mohlman index (now known as the Sludge Volume Index) may easily be converted into the Donaldson index (now known as the Sludge Density Index.)

$$\text{S.D.I.} = \frac{100}{\text{S.V.I.}}$$

It is immaterial which index is used since all are based on the relation between the volume of settled sludge and the weight of suspended solids.

The index varies with the volatile solids content in such a way that the higher the volatile solids, the poorer the sludge index. No single value may be considered as critical for all plants but should be determined for each individual one. The use of the index is helpful in control of the aeration process because it indicates when trouble is approaching and gives the operator a feeling of security when the index consistently shows a well-settling sludge.

The microscopic examination of activated sludge to determine the numbers and types of organisms is a valuable aid to plant control especially where the condition of the sludge is variable. A compact floc with abundant stalk ciliates, few flagellates, and very few filamentous bacteria indicates a good sludge. Diffuse floc, many flagellates and amoebae, few ciliates, and a preponderance of filamentous forms means a poor settling sludge. The frequency of microscopic examination will depend upon the individual plant. When the sludge appears to be well conditioned, an occasional examination is sufficient but when there is reason to suspect trouble, daily examinations may be necessary.

Sampling

In order to control the process and determine accurately the operating results, as many samples as practicable should be collected at regular intervals throughout the 24 hours of the day. The purpose of collection of samples of sewages and effluents is to obtain a representative sample of the liquid for use in making a laboratory examination. The great variety of conditions under which collections must be made make it impossible to set up a fixed procedure.

The standard method comprises collection of composite samples over two 12 or one 24-hour period. Individual portions should be collected at least every hour and mixed at the end of the sampling period or combined in a single bottle as collected. A final volume of 2 to 3 liters is generally sufficient for sewages and effluents. It is

desirable to combine individual samples in volumes proportional to the volume of flow.

All samples should be analyzed as soon as possible after collection and kept in a cooler until analyzed.

Grab samples, except for the dissolved oxygen determinations and for bacteriological examination, are not satisfactory.

Routine Tests

Certain routine tests are particularly helpful in controlling operation. Determinations of dissolved oxygen and suspended solids in the aeration tank are used to control the amount of air used and to maintain the proper suspended solids concentration. Settling tests on aeration tank effluents are needed together with the suspended solids to calculate the sludge index. Centrifuge tests are used as a rapid check on the concentration of sludge to control wasting of sludge. The depth of sludge or sludge blanket in concentration tanks is also a valuable aid in controlling the wasting of sludge. The use of the microscopic examination has already been mentioned. Along the coast, the determination of chlorides in the raw sewage is helpful in ascertaining the leakage of tide water into the sewerage system. Wide variations in pH values indicate discharges of industrial wastes.

Routine laboratory analyses useful in plant operation include the following:

Raw and settled sewage
- Biochemical oxygen demand
- Suspended solids
- Volatile suspended solids
- Organic nitrogen
- Ammonia nitrogen
- Settleable solids (by vol.)
- pH
- Chlorides

Activated sludge effluent
- Biochemical oxygen demand
- Suspended solids
- Volatile suspended solids
- Organic nitrogen
- Ammonia nitrogen
- Nitrate nitrogen
- Nitrite nitrogen
- Dissolved oxygen

Aeration tank effluent
- Suspended solids
- Settleable solids (by vol.)
- Dissolved oxygen

Return sludge
- Suspended solids

Primary and waste activated sludge
- Total solids
- Volatile solids

Tests such as the suspended solids, BOD., and nitrogen determinations are not used directly in plant control as the time required to make them is too long. They are extremely useful in giving an overall picture of the efficiency of treatment. The suspended solids and BOD. determinations are particularly valuable in showing the progress of purification through the plant and the work done by the individual units.

Disposal of Excess Activated Sludge

Because of the high moisture content of excess activated sludge, it is necessary to concentrate it before disposal. A common method of thickening it is to return it to the raw sewage so that the activated sludge solids are removed with the sewage solids in the primary settling tanks. Theoretically, the activated sludge floc should help clarify the sewage and cause better removal of suspended solids in the primary tanks.

If, however, the excess sludge is light, and primary settling period is too short, there is some danger of poorer settling portions passing through the primary settling tanks and tending to build up in the aeration system with a consequent deterioration in the quality of the sludge. When the excess sludge settles well, discharge of the sludge to the primary tanks at a low uniform rate is reasonably satisfactory if the sludge is removed frequently from the primary tanks. Success probably depends largely on the volatile solids content of the sludge. Low volatile solids mean rapid settling and satisfactory removal of the sludge in the primary tanks. High volatile solids mean poor settling and passage of sludge through to the aeration tanks.

Separate concentration tanks are used at many activated sludge plants to thicken either aeration tank effluent or return sludge. Some operators believe that the fresh aeration tank effluent concentrates better than the stale return sludge. In any event, the effectiveness of the concentration will depend to a considerable extent upon the percentage of volatile solids.

The concentrated sludge may be disposed of in many ways, such as: digested, dried and used for fertilizer, dried and incinerated or barged to sea. Pearse reported that about 90 per cent of the activated sludge plants were disposing of the excess activated sludge in separate sludge digesters.

Tallman's Island Sewage Treatment Plant, New York City (Diffused Aeration)

Purification Obtained

An important characteristic of the activated sludge process is the high degree of purification which may be obtained. So much of the suspended solids and colloids may be removed that under ordinary circumstances, the settled effluent will be clear and contain but little suspended matter. The removal of suspended matter and BOD. varies from 85 to 97 per cent. As shown in Table II, the average removal of suspended solids and BOD. from twelve representative plants was more than 90 per cent.

At Wards Island, the average removal of bacteria growing on agar at 37° C. has been 98 per cent and of members of the coliform group, 99 per cent. The number of bacteria remaining, however, usually make chlorina-

TABLE II
Chemical Analyses

PLANT	SUSPENDED SOLIDS				BOD.			
	Raw Sewage ppm.	Settled Sewage ppm.	Final Effluent ppm.	% Removal	Raw Sewage ppm.	Settled Sewage ppm.	Final Effluent ppm.	% Removal
Chicago, Calumet	129	...	12	92	92	...	9	90
Chicago, North Side	139	...	10	93	115	...	6	95
Cleveland, Easterly	239	165	12	95	148	106	13	91
Finolay, Ohio	427	90	11	97	405	121	21	95
Gary, Ind.	302	95	10	97	129	63	9	93
Jackson, Mich.	191	141	17	91	122	118	7	94
Marion, Ohio	241	104	12	95	145	98	9	94
Muskegon Hts., Mich.	305	134	69	77	357	193	52	86
New York, Wards Is.	204	...	20	90	167	...	14	91
Pasadena, Tri-City	303	...	27	91	149	...	13	91
Rockville Center, N. Y.	284	146	25	91	288	160	41	86
Springfield, Ill.	132	81	8	94	103	74	8	92

tion necessary for disinfection where the effluent of an activated sludge plant is discharged in the vicinity of bathing beaches or shellfish layings.

Sludge Bulking

Good quality activated sludge settles rapidly and a tendency toward slower settling and a poorer sludge index is an early sign of deteriorating sludge quality. As the floc particles increase in size and decrease in density, the depth of sludge or the sludge blanket in the final settling tanks increases until natural currents carry the solids over the weirs with the effluent.

This bulking or swelling of the sludge in volume is associated with loss of sludge activity and is characterized by a low settling rate and by a very poor sludge index. Filamentous growths such as Sphaerotilus are usually present in the stringy, deflocculated sludge. These organisms, however, are probably symptoms of a sick sludge, rather than a cause. Many causes have been given for bulking but the most important are too high or too low concentration of solids in the aeration tanks, insufficient air, overloading or very high volatile content of the suspended solids.

If the concentration of suspended solids is permitted to increase to such a point that aerobic conditions are not maintained throughout the aeration tanks, bulking may occur. Insufficient air is an important cause. If the concentration of solids decreases to about 500-800 ppm., a critical range is reached where very poor settling results. A further decrease in aeration tank solids yields a sludge which settles very rapidly.

Activated sludge may become sick by being overloaded; that is, by adsorbing more decomposable organic matter than the available oxygen will oxidize. A good sludge may deteriorate by the addition of an abnormally strong sewage and will be overpowered if overloading is long continued. Overloading is often caused by large amounts of industrial wastes.

High volatile solids content of the aeration solids appears to be a frequent cause of bulking, particularly in the summer. Relief is commonly obtained by a rain where the sewage is collected in a combined system.

The correction of bulking seems to depend upon a restoration of balance between oxygen demand and supply. This may be done by: (1) increasing the air supply; (2) adjusting the suspended solids in the aeration tanks, reducing them if they are too high and increasing them if necessary; (3) decreasing the sludge activity by the addition of chlorine; (4) bypassing part of the sewage flow if possible, and (5) evening out the flow of industrial waste if overloading is caused by intermittent discharge.

Chlorination of returned sludge has been successful in combatting bulking at a number of plants. The amount of chlorine used depends upon the concentration of solids and at Lima, Ohio, the dosage averaged 8.5 ppm. for each per cent of suspended solids in the returned sludge. In some cases, treatment with chlorine has not been successful.

Rising Sludge

Another operating problem is the occasional rising of large masses of sludge to the surface of final settling tanks. This may occur when nitrification is high and in the absence of oxygen the nitrates in the sludge blanket are decomposed to form nitrogen gas. The bubbles of gas will carry sludge masses to the surface. This condition is quickly corrected by reducing the amount of air applied. Increasing the sewage load or reducing the aeration tank solids in the unit causing the trouble is also said to be helpful.

Rising sludge may also occur as the very dense sludge in a final settling tank or concentration tank becomes septic. The gases formed become entrained in the sludge and carry it to the surface. The septic sludge must be removed and the sludge blanket kept low to prevent septicity. Failure of the sludge collectors to keep the tank bottom clean during warm weather is a common cause of this trouble.

Modifications of the Activated Sludge Process

By varying the air supply, the aeration period and the amount of returned solids, any degree of purification between sedimentation and conventional activated sludge may be obtained. For partial treatment, low air supply and small tank capacity are sufficient. Greater air supply and tank capacities will permit more complete treatment. Where conditions warrant, a high rate activated sludge offers a means for substantial economies in construction and operating costs. It is emphasized, however, that the type of treatment depends upon the degree of purification required. Where the highest degree of purification is necessary, conventional activated sludge should be used.

TABLE III

Modifications of the Activated Sewage Process

Plant	Date	Aeration Period Hours	Air Cu. Ft. Per Gal.	Sludge Returned %	Aeration Tank Solids ppm.	BOD. % Removed
Indianapolis	1942	6.4	0.49	0.0	156*	59
New York, Jamaica	Sept. 1944	2.28	0.29	16.0	365	70
New York, Jamaica	June-Aug. 1944	2.35	0.32	27.0	630	71
Rockville Center, N. Y.	1942	5.03	2.0	3.5	740	86
New York, Bowery Bay	1942-43	2.6	0.59	46.0	1800	90
Chicago, North Side	1936	3.0	0.37	21.7	...	91

* Suspended Solids—Settled Sewage.

To illustrate the effect of varying some of the factors in the activated sludge process, data from several plants are presented in Table III.

Starting with plain aeration at Indianapolis, 59 per cent removal of BOD. was obtained in 6.4 hours. With very low aeration tank solids and a short aeration period at Jamaica, 70 per cent BOD. was removed and by increasing the solids, a slightly better effluent was produced. At Rockville Center, longer aeration with moderately low solids yielded 86 per cent removal of BOD. and at Bowery Bay, a short aeration period with high suspended solids produced an effluent of the same quality expected from the conventional activated sludge plant.

In varying from the conventional method of operation, the activated sludge process becomes more sensitive to shock and fluctuations of load and flow, and requires much more careful supervision.

If any conclusion can be drawn from a paper of this kind, it is that because of factors such as differences in characteristics of the sewage and variations in flow, each activated sludge plant is different from any other. No arbitrary rules for plant operation can be safely set up beforehand and many of the variables can be fixed only by experience.

Mention should be made of two excellent reviews of activated sludge operation. The comprehensive report of the Committee on Sewage Disposal of the American Public Health Association, of which Langdon Pearse was Chairman, was published in the *Sewage Works Journal* 14, 3, 1942. W. H. Wisely has presented additional data in a paper published in the *Sewage Works Journal* 15, 909, 1943, and reprinted in the June, 1944, issue of *Water Works and Sewerage* (Ref. & Data section). Some of the information presented in this paper has been taken from these sources.

Arthur V. Ruggles Dies

Arthur V. Ruggles, longtime Civil Engineer attached to the water works division of the New York State Public Service Commission, died on Oct. 21. Mr. Ruggles, a resident of N.Y. City, was a native of Clinton, Mass. In World War I he served in France as an Army engineer with the rank of captain, engaged in water supply.

Mr. Ruggles was Water Commissioner of Cleveland, Ohio, in 1922-23, and later was associated with the U. S. Cast Iron Pipe Co. and then with the Community Water Service Co., both in New York City. A member of the Am. Soc. Civ. Engrs., and the New England Water Works Assn., Mr. Ruggles was the recipient of the Dexter Brackett Memorial Award of the NEWWA in 1943 for his paper titled "Determination by Statistical Methods of the Average Service Life of 6-in. Cast Iron Water Mains in Brooklyn, N. Y."

SEWAGE WORKS FEDERATION BOARD ACTIONS

1946 Convention to Be Held in Toronto on October 7, 8, 9 as Tentative Dates. Canada and Arizona Win $100 Membership-Gain Prizes. Hoskins Made President and Friel Vice-President

Presidents

Dr. A. E. Berry
Chief Engineer
Ont. Dept. Heal'h
Toronto
(Retiring)

Adm. J. K. Hoskins
Div. of Engineering
U.S.P.H.S.
Washington
(Incoming)

IN CHICAGO on October 17th and 18th the Board of Control of the Federation of Sewage Works Associations held its 18th Annual Meeting with an exceptional attendance of thirty-seven directors, officers and committee chairmen. Although only four national conventions have been held by the Federation, the Board of Control has met annually for 18 years. The meeting in Toronto will be, therefore, designated the 19th Annual Meeting of the Sewage Works Federation.

Federation Growth

The reports of the Executive Secretary and the Treasurer revealed, as of the date of the meeting, a gain by the Federation of 245 members for the year making the total membership 3233.

In the new-member-gain contest, the Canadian member association won the prize of a $100 war bond for having brought in 72 new members—the greatest numerical intake of new members. For the highest percent gain in new members the other $100 war bond went to the Arizona Sewage and Water Association, which has recorded a 140% gain in membership during the year.

In the report of finances the Federation books show an increase in worth amounting to $8,000 for the year. Its "nest egg" of securities and cash has grown neatly by $6,000 during the year to the satisfactory total of $32,563.06, which puts the Federation well over the "hump" of financial strain which had been expected when the Federation established a central headquarters office, a paid full-time executive secretary and staff. Considerable of the financial gain has been due to advertising increase in the Journal in addition to membership growth, both of which have exceeded budget estimates.

Honorary Member

Dr. Willem Rudolfs
Rutgers University
New Brunswick, N. J.

Award Winners

H. W. Streeter
Lieut. Col.
U.S.P.H.S.
Cincinnati, O.

*J. D. McDonald**
Supt.
Sewage Treatment
Springfield, Mass.

*(*On leave in military service)*

Vice-Pres.

Francis S. Friel
Cons. Engr.
Philadelphia, Pa.

Exec. Secy.

W. Homer Wisely
F.S.W.A.
Champaign, Ill.

Honors and Awards

The Board recognized the long and continuing work of **Dr. William Rudolfs** of Rutgers University to the Federation and in consequence bestowed upon him Honorary Membership "as a staunch supporter and worker in the interests of the Federation since the time of its organization." Dr. Rudolfs is best known, perhaps, for his work as Research Committee Chairman.

To **Lloyd R. Setter** of the Bureau of Sewage Disposal of New York City went the Harrison P. Eddy Award for "outstanding research contributing in important degree to the existing knowledge of the fundamental principles of processes of sewage treatment and in recognition of his contribution to *Sewage Works Journal* entitled 'Modified Sewage Aeration.'"

Voted the Kenneth Allen Award by Their Associations

Dario Travaini
Supt.
Sewage Treatment
Phoenix, Ariz.

Joe Williamson
Cons. Engr.
Jacksonville, Fla.

Geo. S. Russell
Cons. Engr.
St. Louis, Mo.

F. H. Waring
Chief Engr.
Ohio Dept. Health
Columbus, O.

H. E. Moses
Chief Engr.
Pa. Dept. Health
Harrisburg, Pa.

(1)
Stanley Shupe
(Canada)

(2)
Clyde C. Kennedy
(California)

(3)
C. C. Larson
(Central States)

(4)
Kenneth Piper
(Dakota)

(5)
M. Le Bosquet
(Federal)

(6)
Fred Eidsness
(Florida)

(7)
Van P. Enloe
(Georgia)

(8)
H. A. Wycoff
(Georgia)

(9)
John W. Pray
(Iowa)

(10)
Paul D. Haney
(Kansas)

(11)
A. L. Genter
(Md.-Del.)

(12)
Ralph Fuhrman
(Md.-Del.)

(13)
W. Q. Kehr
(Missouri)

(14)
John H. Brooks
(New England)

(15)
M. S. Kachorsky
(New Jersey)

(16)
Edw. J. Smith
(New York)

(17)
Arthur H. Niles
(Ohio)

(18)
Dana E. Kepner
(Rocky Mtn.)

(19)
W. S. Mahlic
(Texas)

(20)
W. B. Marshall
(Mfgr's Ass'n)

(21)
F. W. Lovett
(Mfgr's Ass'n)

Board Members in Attendance at the Meeting.

Past Presidents

Chas. A. Emerson
Con. Engr.
New York

G. J. Schroepfer
Prof. San. Eng.
Univ. Minn.
St. Paul, Minn.

To **John D. McDonald**, Sup't. of Sewage Treatment now on leave from the armed forces, went the George B. Gascoigne Award in recognition of "an outstanding contribution to the art of sewage works operation through the successful solution of important and complex operational problems," as evidenced by his article "Sludge Disposal Experiences" which appeared in *Sewage Works Journal.*

To **Harold W. Streeter**, sanitary engineer in the U. S. Public Health Service, went the Charles A. Emerson Award in recognition of his valuable researches in the fundamental principles of natural purification of poiluted streams, and of his services to the Federation during its formative period and his continuing loyalty to the Federation; also, for his outstanding services in the field of sewage treatment."

The Kenneth Allen Awards, made by member associations in the Federation to an outstanding member in each instance, were voted to the following—

The Arizona Sewage and Water Ass'n. to **Dario Travaini**, Sup't. of Treatment at Phoenix, Ariz.

The Penna. Sewage Wks. Ass'n. to **Howard E. Moses**, Chief Engr., Penna. State Dep't. of Health.

The Board has now established an additional award or prize which will be voted the individual who produces the most outstanding annual report covering sewage works operation. It is to be known as the William D. Hatfield Prize. Each member association will select the most conspicuous operation report submitted by its members. These top rating reports will then be judged by a committee of the Federation and the winning report will bring the Federation's recognition and award to its author, for the Nation's outstanding report on plant operation.

Officers Elected or Appointed

Officers elected for the year 1945-46 were:

President: Admiral J. K. Hoskins, U.S.P.H.S., Washington, D. C.

Vice President: Francis S. Friel, Consulting Engineer, Philadelphia, Pa.

Treasurer: W. W. DeBerard, City Engineer of Chicago, Ill. (re-elected).

Executive Secretary-Editor: W. H. Wisely, Champaign, Ill. (re-appointed).

Advisory Editor: F. W. Mohlman, Director of Laboratories, Sanitary District of Chicago (re-appointed).

Harold F. Gray, Consulting Engineer of Berkeley, Calif., was elected to the office of Director-at-Large for a three-year term.

Committee Reports

The Committee reports presented to the Board at this meeting were notable for the interest, effort and progress represented. Many of the reports cited the excellent progress which is being made in the performance of Committee functions.

Treasurer
W. W. DeBerard
City Engr.
Chicago

Advisory Ed.
F. W. Mohlman
Chief Chemist
Sanitary Distr.
Chicago

manuals, stating that those on sewage chlorination, trickling filters, and sewer ordinances were expected to be developed in 1946 while the manuals on plant operation reporting units, sewage aeration and on sewer maintenance would probably reach the production stage in 1947. In addition, a manual on "Costs and Cost Keeping" is planned.

The Committee on Sewage Works Nomenclature reported that the glossary of Water and Sewage Control Engineering has cleared through the hands of its editor, C. L. Bogert, early in October and would be submitted to the printer at an early date. The glossary is a joint project of the Federation with ASCE, APHA and AWWA.

The Committee on Qualifications of Sewage Works Operators presented a final report which was accepted by the Board. The report sets forth current practices in registration and certification of sewage works personnel and offers recommendations for the guidance of agencies interested in the establishment of such programs. The committee has been retained in service

Committee Chairmen*

(Sew. Wks. Practice)
M. M. Cohn
Sanitary Engr.
Schenectady, N. Y.

(Publications)
F. W. Gilcreas
Chief, W. & S. Lab.
N. Y. Dept. Health
Albany

(Standard Methods)
W. D. Hatfield
Supt.
Sanitary Distr.
Decatur, Ill.

(Publicity)
Linn H. Enslow
Editor
Water Wks. & Swge.
New York

(Organization)
Earnest Boyce
Prof. San. Eng.
Univ. Michigan
Ann Arbor

**Also Board Members.*

The Florida Sewage Wks. Ass'n. to **Joe Williamson, Jr.**, Consulting Engr. of Jacksonville, Fla.

The Kansas Water and Sewage Wks. Ass'n. to **Murray A. Wilson.**

The Missouri Water and Sewage Conference to **Geo. S. Russell**, Cons. Engineer of St. Louis, Mo.

The Ohio Sewage Wks. Conf. to **F. Holman Waring**, Chief Engr., Ohio State Dep't. of Health.

The report made by Chairman Cohn of the Sewage Works Practice Committee was particularly significant. It discussed the success of the first manual of practice entitled "Occupational Hazards in the Operation of Sewage Works" and reported that the manual on the "Utilization of Sewage Sludge as Fertilizer" is expected to be issued early in 1946. He continued with a timetable on other for the purpose of activating its requirements.

A new committee, to be known as the Legislative Analyses Committee, was created by the Board and personnel are to be named later by President Hoskins. This committee will study state and national legislation pertinent to the interests and objectives of the Federation and will keep the Board advised on such legislative matters.

Journal Improvements

Upon recommendation of the Publications Committee, the Board authorized the Editor to adopt a two-column page to replace the full measure format now used in *Sewage Works Journal*. The two-column page possesses several advantages from the standpoints of the reader and of mechanical production. The new format will be introduced with the January, 1946, issue.

With a view toward better service to the users of the Journal, the Board instructed the Publications Committee to undertake a detailed study of the possibility of producing the Journal on a monthly instead of a bimonthly schedule. The study and report is to be presented to the Board for action at the next annual meeting, October 1946.

78th Congress, and printed in the Journal for March, 1945.

Because of its potential beneficial effect in the elimination of industrial stream pollution, the Board acted to endorse in principle the Bailey Bill (H.R. 3972), which would allow an industry to deduct the cost of waste treatment works in the computation of net income for tax purposes.

The Executive Secretary was instructed to transmit the views of the Board to each member of the congressional committees in which the above bills are under consideration.

"Club Room" Entertainment Endorsed

In an effort to eliminate competitive and conflicting entertainment in private hotel rooms during meetings and conventions, the pooling of interests by the manufacturers' representatives in the form of so-called "Club Room" entertainment (a sort of open-house idea restricted to members and registered guests of the Association—a "get-together" if you please) has been favorably accepted, where tried, as a solution to a perplexing problem. After some discussion and clarifying questions, the Board took action endorsing the "Club Room" type of entertainment and requested the Manufacturers' Association to try it at the Toronto meeting next year. The Board also looked with favor on this "Club Room" idea as a promising solution to the problem of controlled entertainment at meetings of the member Associations.

on the "Responsibilities of the Sewage Works Field in Meeting its Greatest Challenge" was jam packed with food for thought.

Dr. Berry's talk covered the technical and managerial responsibilities which have been so well met in the past, and of the need for further progress and the increasing need for cleaner streams and an expansion of municipal sanitation. For the immediate time Dr. Berry stressed the sound financial position of municipalities in general. Considering such a situation, the greatest of all current responsibilities of those comprising the sewage works and sanitation profession, is that of making immediate and serious effort to secure new and improved sewage treatment facilities. He pointed out that there never has been in the past, and probably never will be for some time to come, the same opportunity to get appropriations for these improvements as is now the case. He thought that if this present opportunity is permitted to slip away from us, without having made the extra effort to secure appropriations for sewerage betterments, that the sewage works profession will have failed in its duty to a point of great future regret. Procrastination and slowness of action may well mean that the available monies will all have been appropriated or used in other directions, and municipal credit may no longer be in the favorable position of the present. The opportunity is ours to make the best use of, the responsibility great if we fail to do so.

The Board's Annual Dinner and CSSWA's Luncheon

A shot of head table, at left, and the 37 board members. On right, Retiring Pres. Berry addressing the special luncheon meeting of the Central States Assn.

Membership Gain Prizes Continued

The Board authorized continuation of the membership contest in 1946. A cash prize of $100 will be awarded the member Association which shows the largest numerical increase in membership during the year. A like prize of $100 in cash will go to the Association showing the greatest per cent gain in members. This prize is especially attractive to the smaller Associations, while the other is most likely to be won by one of the larger Associations. In any case these prizes are well worth going after. It is, of course, possible for a medium-sized Association to win both of these prizes.

Action on Legislation

A recently amended draft of the Spence Bill (H.R. 4070) was considered by the Board, and action was taken to reaffirm the resolution which was adopted on this bill as presented in the

CSSWA Luncheon Hosts

At the conclusion of the Board meetings, members became guests of the Central States Association at a specially arranged luncheon attended by 135.

Dr. Berry, retiring president of the Federation, was the speaker. His talk

Following the luncheon, inspection trips were made to the Chicago Southwest Treatment Works and the Southside Filtration Plant, which continues under construction while in operation as a coagulation and clarification unit pending completion of the filters.

New Technical Societies Council in Kansas City

Chas. Briggs of Burns-McDonnell, Sec'y-Treas.

Seventeen professional and technical societies of the Kansas City area joined together in establishing the Technical Societies Council for unified action in matters pertaining to the development of scientific endeavors.

What makes this news of interest to us is the fact that Charles Briggs of Burns and McDonnell Engineering Co. was elected Secretary-Treasurer, and Melvin P. Hatcher of the Kansas City water works is one representative of the Am. Soc. C.E.; Briggs represents ASME.

The organization, composed of two representatives from each of the seventeen societies, will publish a monthly bulletin programming the activities of all of the member organizations, and will support the establishment of better technical and scientific laboratories, and encourage improved technical education and vocational guidance.

Rohlich Returns to Penn State

Gerald L. (Gerry) Rohlich, who left Penn State College to serve on L. H. Kessler's staff in the Repair and Utilities Branch of the Army Engineer Corps during the war returned to State College this past summer as Assoc. Prof. of Sanitary Engineering. "Gerry" proposes to expand the sanitary engineering department and will soon have available an opening for a sanitary chemist on the staff.

CENTRIFUGAL PUMP PECULIARITIES*

A Review of Several Known Peculiarities and Some Not So Well Known

By ROBERT W. ANGUS
Consulting Engineer
TORONTO, ONT.
(*Professor Emeritus of Mech. Engineering, Univ. of Toronto.*)

PRACTICALLY all pumping units now being installed in water works plants are composed of centrifugal pumps driven by electric motors, steam turbines or internal combustion engines, and few plants today use reciprocating pumps. Experience with centrifugal pumps has now been sufficiently extensive for operators to know many of their peculiarities; yet there are features connected with their use that are worthy of review.

The Author

Setting of Pump

The setting of the pump is perhaps one of the most important matters, as it may easily account for any later defective operation. It is, of course, well known that the pump should be set as little above the well level as possible, and it is usually preferable to have it below this level (except for the difficulty of unwatering it) if for no better reason than ease of priming and freedom from the foot valves on the suction line. That the pump is unduly sensitive to suction conditions is a matter of general experience, and long and crooked suction piping is to be avoided.

The author has made tests on the effect of foot valves, which showed that resistance in these might cause a high vacuum at the suction flange of the pump and a corresponding decrease in discharge. [*Jour. AWWA*, 37: 70 (1945)]. High-suction vacuum naturally induces air leakage into the pump through the glands, and also releases whatever air there is in the water being pumped. In order to investigate the effect of air leakage, a number of experiments were run on a 4-in. pump, in which various volumes of air were admitted into the suction pipe after carefully sealing the glands so that leakage was practically stopped there.

In this pump the percentage decrease in discharge at a given head was roughly proportional to the percentage, by volume, of air admitted, so long as the latter remained below about 1.5 per cent (see Fig. 1); but thereafter the water discharge fell off very rapidly until there was a decreased discharge of over 40 per cent when 4 per cent of air, by volume, was admitted. This merely confirms the well-known fact that at low suction lifts, and consequently low air inlet leakage, the exact elevation of the pump is not so important. There is a critical elevation for each pump and condition, however, and if this is exceeded the loss of water increases at a rapid rate. Clearly the height of the pump above the well level should be kept substantially below this critical elevation.

Specific Speed

Fortunately the importance of this matter is now recognized by the pump builders, and they have found that for each head, discharge and speed there is a maximum height above the well at which each pump should be set. These three quantities are combined in a formula for "specific speed" which is defined by:

$$\text{Specific speed} = N \times \sqrt{G}/H^{0.75}$$

where N is the revolutions per minute, G is the discharge in U. S. gallons per minute and H is the head in feet.

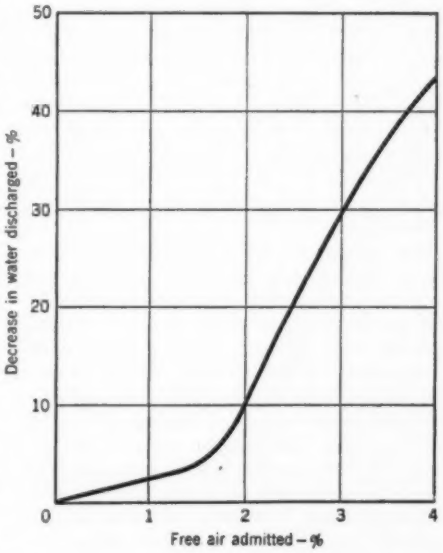


Fig. 1—Decrease in Discharge of Centrifugal Pump Due to Admission of Air Into Suction Pipe in Various Amounts.

Pump builders have co-operated in connecting the specific speed and head with the maximum allowable suction lift, basing their conclusions on laboratory tests and on experience with pumps which they have installed. Through the Hydraulic Institute they have given these maximum elevations in the form of diagrams, separate ones being used for single-entry pumps, for double-suction single-stage pumps, etc.

As an illustration, there are four double-suction single-stage raw water pumps at the Victoria Park pumping station, Toronto, Ont., rated at 24, 30, 48 and 60 mgd., respectively, all of them for 9-ft. suction lift and for a total head of 82 ft. The two larger pumps operate at 750 rpm., and if this speed had been adopted for all four pumps, their specific speeds and maximum suction lifts, including velocity head and friction in the suction pipe, would have been as shown above in the Institute's chart.

Size of pump, mgd. (U. S.)	24	30	48	60
Specific speed at 750 rpm.	3545	3970	5010	5610
Maximum allowable suction lift, *ft.*	18	15	5	..
Necessary suction pressure, *ft.*	..	..	..	5
Specific speed at 500 rpm.	..	..	3340	3749
Maximum allowable suction lift, *ft.*	..	..	20	17

Since the velocity heads in the two larger pumps are 2.3 and 2.1 ft., respectively, and since friction must be allowed for, it is clear that, while there is a margin on the two smaller pumps when run at 750 rpm., the two largest pumps could not be run at this speed and had to be changed to 500 rpm., which is the next available speed.

Setting pumps too high not only causes them to lose capacity, but also means noisy operation and cavitation, which is frequently destructive. As the capacity of a pump at fixed speed is gradually increased by lowering the discharge pressure a point is finally reached where the characteristic curve is nearly vertical, which point naturally corresponds to the limiting output of the pump. Cavitation and noise are present at such a discharge (and in its vicinity) and the higher the suction lift the lower this limiting output is. It is to avoid too close an approach to this point that the charts reproduced have been made. Noise in a pump operating near this limiting point may often be stopped by the admission of a very small volume of air to the suction pipe.

[Ed. Note—Indeed an interesting and illuminating statement in view of the

*Professor Angus' paper was presented before the Canadian Section of AWWA. Its reproduction here has been authorized by the editor of the *AWWA Journal*.

(An article intended for our strike-bound October issue.)

generally held misconception that cavitation, with its noise of pebbles or buckshot passing through the centrifugal casing, is due to air within the casing. On the contrary, it appears that the noise is due to partial vacuum within the casing which is relieved by admitting air.]

Power Failures & Water Hammer

Power failures on motor-driven centrifugal pumps present some problems. A check valve is usually placed on the line close to the pump, and if this acts slowly there is backward flow through the pump which reverses its direction of rotation unless specially prevented. If the check valve does act rapidly, however, water-hammer pressures are often excessive, resulting in damage to the plant. A number of cases of the latter have recently come to the author's attention.

Water hammer, contrary to a common belief, is also often dangerous in low-head pumping. The author made some tests on a 12-in. pump working against a 55-ft. static head, with a discharge line only about 350 ft. long, and recorded the pressures with a Crosby indicator with a 30-lb. spring. When the switch was opened the pressure drove the indicator pencil off the top of the drum, indicating a pressure of more than 60 psi., and the first pressure wave measurable showed 50 psi. or a 115-ft. rise. As stated, this was a short line and the pipe velocity was under 4 fps. However, in another case where the static head was 40 ft. and the line was over 2,000 ft. long, the pressure rose to 83 ft. with normal pipe velocity of slightly over 7 fps. In both cases the pressure rise was high enough to cause some anxiety, which was further aggravated in the first case by the noise and shock plainly observed at the pump, while in the second case there was *no* apparent shock on the system. In the first case, the maximum pressure rise occurred 2.6 seconds after cutting off the power, whereas it took 13.0 seconds in the latter case.

Short lines are sometimes more dangerous than long ones, because in the latter the water takes an appreciable time to slow down before coming backward, thereby giving the check valve time to close *gradually* and prevent any real reverse flow of the column. In short runs of pipe the water column reverses in much less time, as the above measurements show, and actually *before* the check valve has had time to close. Thus the water gains a high backward velocity, suddenly closing the check valve with a slam, and producing high pressures. The maximum pressure rise, in feet, reaches about one hundred times the velocity of the water in the pipe at the time the valve suddenly closes.

Air Chambers vs. Properly Closing Check Valves

Sometimes an effort is made to decrease the danger by using an air chamber, but this is far from the best method and does little good unless the chamber is placed on the line near the pump and has a large short connection with the pipe. Air chambers connected to the line with a fairly long branch pipe are of little value and, of course, any virtue the device has will be lost unless there is a good volume of air in the chamber under normal conditions. A well-designed check valve, with a proper controlling mechanism which permits the greater part of the closure to be rapid and the latter part gradual, offers a good solution, and a number of such valves are now on the market. It is a fact that, unless the pump is equipped with a heavy flywheel, as is sometimes the case, the pump will often run backward before the check valve closes, but, in general, the reverse speed is not over 20 per cent higher than normal running speed and is not dangerous from that standpoint.

In many installations reverse rotation of the unit causes little difficulty, but where sleeves are screwed on the shaft and pass through the packing gland, the builder usually makes the thread so that during pumping the tendency is to tighten the sleeve against the impeller. If the glands are tight, then when the pump runs backward the sleeves may unscrew, and cases are not unknown where the pump has been damaged by breaking off the bearing bracket. With the sleeve unscrewed the impeller is not properly restrained from moving along the shaft and this further increases the danger of damage.

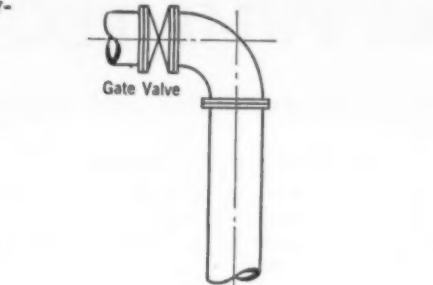


Fig. 2—Unusual Pump Arrangement That Resulted in Heavy Water Hammer Pressures Until Vacuum Pump Was Installed to Exhaust Air From Discharge Pipe and Fill It With Water Before Starting Up.

Pumping Plants

There are some unusual installations, one of which may be mentioned as an illustration (see Fig 2). A very large-size pump with a vertical shaft was set up with 40 ft. of vertical discharge pipe, followed by a long horizontal line. The pump was nearly 20 ft. below the water in the well so that no priming was required, but there were nearly 800 ft. of horizontal suction (intake) pipe in which the velocity was 5.9 fps. at steady operation. It was inconvenient to place the discharge valve close to the pump, and it was actually installed just beyond where the horizontal and vertical pipes joined. There was no valve of any kind on the suction side. In the installation shown diagrammatically in Fig. 2 the distance (A) was nearly 20 ft.

Following common practice, the motor switch was thrown in with the discharge valve closed, and just as the valve started to open when the pump was up to speed, a pressure shock cracked the pump casing. This might have been foreseen, because, when the pump was shut down with discharge valve closed, water in the vertical discharge pipe quickly fell to the well level, leaving a space filled with air in the discharge line between the well level and the valve. On starting the pump against the closed valve the air was compressed to about discharge pressure, and as the valve began to open the air rushed out of line, allowing the water to reach full velocity in the vertical pipe. As the front of this water column reached the partly open valve the velocity was largely extinguished and a heavy water hammer pressure resulted. Since it would have been very expensive to lower the discharge valve, the only remedy was to put in a vacuum pump and exhaust the air, in order to fill the line with water before starting up.

The long horizontal suction pipe greatly complicated the problem, for the water would be drawn from the pump end of it before the column could be sufficiently accelerated to supply the demand, and water hammer pressures would be set up in the pump from this cause. A well should always be close to the pump (or the pump located close to the well) to supply the water demanded while that in the intake line is being brought up to running velocity.

Where several pumps are to work in parallel on the same line, their characteristics should be given careful consideration, otherwise their actual output may fall far short of the sum of their individual deliveries. In Fig. 3 are shown the characteristic curves of two actual pumps, A and B, in the same station, their individual normal operating points being indicated by G and J. If these two pumps are thrown on the line at one time their combined characteristic is shown by the plain curve found by adding the discharges of A and B at the same pressure in each case. The static head, corresponding to the tank level, is shown at D and the curve C indicates

the dynamic head to be pumped against, the vertical distance between D and C corresponding to the resistance loss for the corresponding discharge.

It is to be noted that, while the sum of the separate discharges at rated heads is 180 per cent of the discharge of the larger pump, yet when both are put on the line at the same time the combined discharge at F is only 133 per cent of that of the larger pump, because of the increased pressure. Where the individual characteristic curves are flat this decrease is greater than with steep curves, because a slight increase in pressure corresponds to a large decrease in discharge, but, on the other hand, a pump with steep characteristic at the normal output point has a rapid decrease in pressure for discharge above normal, so that other circumstances must be taken into account.

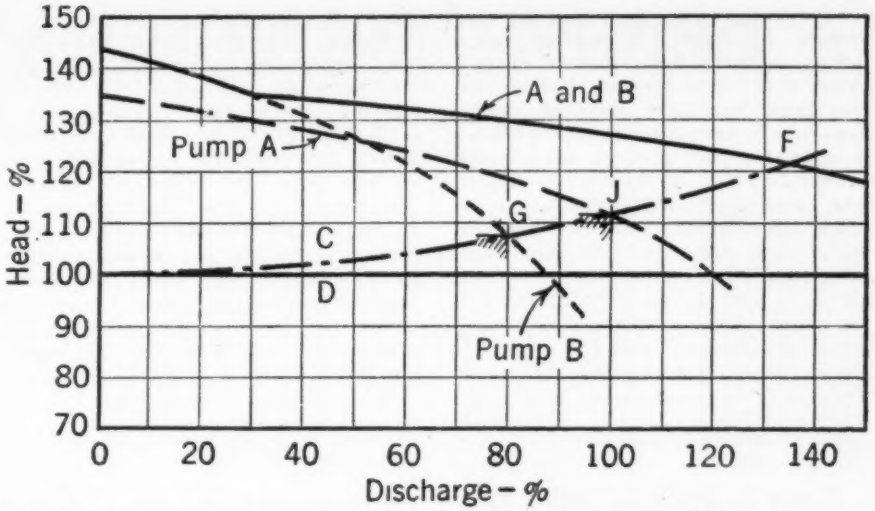


Fig. 3—Characteristic Curves of Two Pumps Operating in Parallel in the Same Station and Discharging Through a Common Header.

Propeller-type Pumps for Low Head Duty

Propeller-type pumps are being introduced to a fairly large extent to cover the field where the head is low and the discharge is large. Centrifugal pumps are used in this service, but must be run at slow speed and involve the use of a speed reducer or an expensive and bulky motor, whereas the propeller-type pump is relatively small and may be run at the speed of the ordinary motor. Its field of service is for drainage and sewage work and for pumping water up to water works filters, but the same type of pump is also used for deep wells because its small diameter enables it to be fitted inside ordinary pipe casing.

As so far developed, these pumps have the undesirable characteristic forms of curves, where the head and power at zero discharge and at full speed are higher than, and sometimes twice as high as, the corresponding quantities at rated discharge, and the curves generally have the reversed form. Usually the pressure is not high enough to cause any trouble, but the high power means a correspondingly large torque on the motor, which the latter may not be able to produce. Therefore either special starting devices are necessary or the pump must not be brought up to speed with a closed discharge valve. With a check valve on the discharge and an open gate valve, the head developed cannot exceed the back pressure from the line, and this is one effective method of starting that is used. Also a bypass is sometimes arranged around the pump, having a valve which may be opened so as to allow some water to flow through the pump, thus avoiding the zero discharge condition.

Deep Well Pumps

Deep well pumps must be as small in diameter as possible so that they will fit into the well casing, and for that reason they approach the axial-flow type with relatively small head per stage, although the high motor speeds somewhat compensate for this. However, for the higher heads many stages are used, and guide vanes are placed between each pair of impellers. Both open and closed impellers are used, but the latter are the more common. The driving motor is often placed at ground level, and the pump is usually submerged in the well water to avoid priming, but since these wells are sometimes 200 ft. deep, the driving shaft is long and has to be guided at various points at which rubber-lined guide bearings are often used with water lubrication.

Some builders, such as Byron Jackson, couple the motor to the shaft as in ordinary installations, and the motor is therefore submerged in the well water and often is actually located *below* the pump.

Power failures on these pumps, where the vertical pipe is long, result in back-flow through the pump and cause the pump to run in the reverse direction, but most pumps of this type are designed to withstand this without damage. However, the surges in the pipe during reverse flow of the water affect the pressures in the pump to such a degree that open impellers may be forced to pound down against the casing and wear somewhat rapidly. Some builders arrange a ratchet or a brake on the pump shaft to prevent the latter from turning backwards.

Where both motor and pump are submerged and completely enclosed, it is difficult to tell whether the electrical connections are such that the pump is running backwards, and in three-phase circuits it is well known that the connection for forward rotation can only be found by trial. If it is impossible to tell by visual inspection whether the pump runs backwards or not, about all that can be done is to read the discharge gage pressure; if this pressure at no discharge is very much below the normal working head on the pump, the motor and pump are, in all probability, running backwards.

Miscellany and Summary

Noise accompanied by cavitation damage in pumps is frequent if the pumps are set high above intake water level. The same results are noticed when the discharge is low, due to either reduced speed or increased head. Foot valves and strainers on the suction inlets may also induce these troubles and should be avoided where possible.

Occasionally cavitation has seriously damaged impellers in less than two years but it is often quite possible to build up the damaged places and completely restore delivery and efficiency. Frequent inspection is necessary. In one case, an impeller was covered with a thick coating of slimy material which decreased the capacity considerably. This pump was used partly for refilling the coagulating basins and was designed for about a 26-ft. head. When the water was low in the well its capacity fell off. A number of operators have found that high suction lift decreases output.

Occasionally, noise in the motor gives the impression that the pump is at fault. Noise in the pump may frequently be greatly reduced by admitting air to the suction side, but this must be carefully controlled, as the capacity falls off rapidly as the admitted air increases. In some tests of one pump 4 per cent of air by volume reduced the capacity nearly 40 per cent.

Putting several pumps in parallel on the same line decreases the capacity of each in a way that varies with the pump characteristics. There is, of course, increased friction in the discharge lines when more water is put through; and, as this increases the head on the pump, there will be a corresponding decrease in discharge.

There is an objection to a common suction header for several pumps, as air may leak through the glands on the idle pumps and interfere with those running. The suction pipe of each pump should run direct to the well as an independent line.

Water hammer and pressure surges

are common on lines having centrifugal pumps. Frequently, a pressure surge, lasting a short time, occurs when a pump is put into service. Power failures cause extensive pressure oscillations which have been greatly reduced by special types of check valves with a controlled time of closure. Air chambers are not as satisfactory.

The shape of the profile of the discharge main greatly affects water hammer in the line after power failure. In the 48-in. line in Toronto, there is a point where the pressure drops much below atmospheric when power fails, and observations agree with the theory that the water column actually separates at this point. The use of a specially controlled check valve with 4-in. bypass has prevented a dangerous pressure rise when the columns re-unite; the purpose of the bypass is to fill enough of the space with water before the velocity of the returning column from the reservoir becomes high enough to cause damage when it re-unites with the part of the column at the pump end. The actual maximum pressure rise is only about 35 per cent and is reached in about 50 seconds where the pipe velocity is low. The pump is about 4,300 ft. from the breaking point of the column and nearly 8 mi. from the reservoir.

Reversal of pumps after power failure has often been observed, but with no harmful results to the motors. A case has been reported, however, of an engine driving a centrifugal pump being damaged by running backward.

Aside from ordinary wear, the mechanical difficulties with pumps are not serious. Some pumps have excessive end thrust, and where this is taken up by ball bearings, the latter run hot. Over-lubrication is known to increase the heating. Bearings are easily cooled with a small stream of water. Hydraulic balancing of end thrust is satisfactory where the pump is running under normal conditions.

Poole Is Back in Indiana

Maj. B. A. Poole, who left the position of Director of the Bureau of Environmental Sanitation in the Indiana Department of Health to join the San. Corps of the Army, has been released from service and has returned to take up his duties in Indianapolis, Ind.

Maj. B. A. Poole

From July, 1942, to April, 1943, Maj. Poole served as Sanitary Engineer at Camp Campbell, Ky., and from April, 1943, to May, 1944, as San. Engr., Office of the Service Command Surgeon, Headquarters, Sixth Service Command.

From May, 1944, until his release on Oct. 12, Maj. Poole was Chief, Water and Sewage Section, Repairs and Utilities Division, Office of the Chief of Engineers. In the latter capacity, Maj. Poole's work involved the direction of all operation nad maintenance of the Army's water and sewage systems in the Zone of the Interior.

During Maj. Poole's absence from his civilian work, his place was filled by Joseph L. Quinn, who resigned as Act. Dir. only recently to become Asst. to the President of Hulman and Co., of Terre Haute, Ind., as noted in our October issue.

Harry Holmes Retires From Mass. Health Dept.

After thirty-five years of continuous service to the State of Massachusetts and its citizens, Harry E. Holmes, Asst. San. Engineer of the Mass. Dept. of Public Health, retired on his 70th birthday, last June 27. That is, Harry Holmes officially retired, but he still goes to work every day as he has in the past because the department is shorthanded and will be until some 20 men return from the service. Then Harry Holmes will really retire.

We Wonder!

Will Singapore Take Up Where It Left Off?

Back in 1939-40, before it was discovered that the guns of Singapore were pointed in the wrong direction, the Singapore Water Department was busy laying water mains.

Singapore Lays a Main Through Precious Rubber Forests

The accompanying illustration shows a 24-ft. section of 39-in. cement lined Class A, C. I. pipe, weighing 5,894 lbs. being lowered by boom from a Caterpillar Diesel Tractor. While the trench is not deep it is practically inaccessible, at places being in the jungle, as much as one and one-half miles from the highway.

This main ran through rubber forests and great care had to be used not to disturb the rubber trees. We have no doubt that the Japs made good use of this line during their occupation of the port city. Knowing that in other Jap-held territories, the water plants have been returned to their rightful owners since the end of the war, we assume that the Singapore Water Department is again on the job. We wonder if they are taking up where they left off. We wonder, too, if they have a great amount of deferred maintenance, if the plant was operating well when the war came to an end, and if the problems of an enemy-conquered water plant are so different from those of our own country where equipment, materials, and supplies have been so short.

Riehl Replaces Scott at Ohio Lab.

Merrill L. Riehl takes the position of Chemist with Division of Laboratories, Ohio State Department of Health, filling the vacancy created by the death of R. D. Scott. Before this Mr. Riehl had been with the Army Fifth Service Command first as Sanitary Engineer, later as Chemical Engineer. His previous experience has been Instructor of Industrial and Sanitary Engineering, Case School of Applied Science, Cleveland, and with Chas. P. Hoover at the Columbus, Ohio, Water Softening and Purification Plant.

NEWWA'S 64th ANNUAL MEETING

One Day Program Draws Attendance of 400 at Boston

Presidents

(Incoming)
H. W. Griswold
Deputy Manager
Met. Water Distr.
Hartford, Conn.

(Retiring)
K. R. Kennison
Chief Engineer
Met. Water Distr.
Boston, Mass.

AT Boston on Sept. 11, the New England Water Works Association held its 64th annual meeting. In spite of the fact that the meeting was confined to but one day (it having been planned before O.D.T. restrictions were eased), the attendance was approximately 400.

New Officers

As a result of the annual balloting the following persons were elected to fill the offices of the association for the coming year:

President: Harold W. Griswold, Deputy Mgr. Bureau of Water, Hartford, Conn.

Vice-Pres.: Don C. Calderwood, Chief Eng'r. Pennichuck Water Co., Nashua, N. H.

Director: Joseph C. Knox, Engineer, State Dep't. Health, Boston, Mass.

Treasurer: William P. Melley, Sup't. Water Dep't., Milton, Mass.

Dexter Brackett Award

The Dexter Brackett Memorial Medal, the highest award of the Association, was presented to Joseph A. McCarthy, Chief of Laboratory, Lawrence Experiment Station, Mass. Dept. of Public Health, for his paper titled, "Bromine and Chlorine Dioxide as Water Disinfectants."

The presentation was made by Percy A. Shaw, Chairman of the Award Committee, who stated that Mr. McCarthy's paper met all of the requirements of the award; it was prepared by a member of the association; published in the association journal; represented original work; and was of benefit to the water works profession as a whole.

In accepting the award, Mr. McCarthy said he did so on behalf of his entire organization. Present to witness the presentation was Harry L. Clark, formerly director of the Lawrence Experiment Station, and himself a one-time recipient of the award.

Committee Reports

Other business before the association included the report of committees. Among the reports of general interest were those on the revision of water quality standards, legislation, post-war planning, and meter specifications.

Secretary
Frank J. Gifford
Consultant
Plaistow, N. H.
(25 yrs. of service)

Treasurer
Wm. P. Melley
Sup't of Water
Milton, Mass.
(Newly Elected)

The committee on water quality standards reported that the U. S. Pub. Health Service Standards, published in 1942, are in the process of revision, and that the revised standards may be expected sometime in the very near future. Those parts of the 1942 standards which have received objections from the NEWWA and the AWWA have been revised to eliminate the objectionable features. One feature of interest is the elimination of the responsibility of the utility for the water supply beyond the curb line. Although the new standards were developed to apply only to water supplied interstate carriers, they will in effect be considered national standards for water quality.

The committee on legislation reported that Massachusetts had provided for establishing emergency water supplies, and had also passed a law which makes it possible to regulate stream pollution and protect water supplies to a degree not before attainable. Rhode Island has created water authorities which may comprise more than one municipality or other political sub-division. Vermont, too, has passed enabling legislation to authorize municipalities to issue bonds and create water authorities.

The committee on meter specifications reported that while it had been hoped to establish the limit of accuracy of meters at 2 per cent, the final limit adopted was 3 per cent to conform to the AWWA specifications. The committee on post-war planning reported its work finished and praised the work of E. L. Filby and the Committee on Water and Sewage Works Development.

Vice-Presidents

(First)
A. L. Shaw
Cons. Engr.
Metcalf & Eddy
Boston, Mass.

(Second)
D. C. Calderwood
Chief Engineer
Penichuck Wtr. Co.
Nashua, N. H.

The Late Secretary of NEWWA

Since the preparation of this report, Frank Gifford, here pictured while attending his last convention, has passed on.

Having completed a 25-year tenure, as secretary of NEWWA in January of this year, Mr. Gifford evidenced his wish to pass the duties of this office to younger shoulders, and on October 4th tendered to the Executive Committee of the Association his formal resignation. Less than twenty-four hours thereafter, on October 5th, 1945, he suffered a stroke and died at his home in Plaistow, N. H., at the age of 67.

Frank Gifford was a native of Fall River, Mass., when he entered the employ of the Fall River Water Dept. immediately after graduation from High School. By 1915 he was equipped to become manager of the Dedham (Mass.) Water Co. and held that position until retirement therefrom about eight years ago to establish a private practice as Public Utility Consultant.

In his mature years Frank Gifford took and completed courses in Public Utility Law at Suffolk Law School. A few years ago he purchased a farm and moved to New Hampshire, interested himself in government and about a year ago was elected to the State Legislature of his adopted state.

Mr. Gifford leaves his widow, one son, Allan T. Gifford, Ass't Professor of Hydromatics at the Mass. Institute of Technology, and three grandchildren.

(An article intended for our strike-bound October issue.)

"Tony" Kirker
Pittsburg Meters
Boston

and

"Al" Brumley
Stuart-Brumley Co.
Baltimore, Md.

"Ed" Sargent, Supt.
Wilmington, Mass.

"Tom" Craven
Warren Fdy. & Pipe Co.
Boston

"Scotty" Marshall, Supt.
Georgetown, Mass.

Major M. Le Bosquet
U. S. P. H. S.
Cincinnati, O.

"Jim" McNulty
Chapman Valves
Indian Orchard, Mass.

Lt. Col. E. F. Twomey
Supreme Hdqtr's Staff
Germany

Roger Oakman, Supt.
Needham, Mass.

Wm. B. Duffy, Supt.
Andover, Mass.

Wm. P. Melley, Supt.
Milton, Mass.

"Al" Lash, Pres.
Geo. A. Caldwell Co.
Boston

"Stan" Johnson
Mueller Co.,
Boston

Roy J. Evans
Eastern Sales Mgr.
Mueller Co.
New York City

Returned Veterans' Problems

Following lunch, Alfred A. Doucet of the U. S. Veterans' Administration, Boston, spoke on the subject of the problems of returned veterans. While Mr. Doucet did not relate these problems to the immediate concern of the water works profession, he did dwell on the broad aspects of the returned soldier's problems.

The problem of tropical diseases and the need for expanding hospital facilities to treat these diseases is but one phase of the work of the Veterans' Administration. Training and reeducation of soldiers, the function of the G.I. loans, service and non-service connected disability are all problems which must be met by an enlightened public and an alert Veterans' Administration. With 15 million veterans from World War II and 5 million from World War I, many of whom have at least one dependent, it is obvious that the veteran can exert a heavy influence on political thinking in this country. The veteran should not have to fight for that which is his due, but neither should he expect favors which he has not earned.

Community Facilities Program

Most water and sewage works men are now aware of the Communities Facilities Bureau of the Federal Works Administration, and how it is making loans to municipalities for the preparation of plans for public works. Mr. L. A. Gillett, Div. Engr., FWA, New York City, gave a little further insight into this program and what it hopes to accomplish.

In the Fed. Wks. Adm. there are three divisions: Public Buildings Administration, Public Roads Administration and the Bureau of Community Facilities. The latter division has been concerned with the administration of the Lanham Act funds, during the war, and with the Advance Planning Program for post-war construction.

It is the intention of this advance planning program to have plans produced and ready for the bidding stage. To accomplish this, the Bureau has been allotting funds to municipalities for the preparation of plans. The funds so allotted are to be repaid by the municipality only if and when the project is financed and construction begins.

Pres. Roosevelt had estimated that $75,000,000 would be necessary for the planning of but one year's construction program; Congress appropriated only $17,500,000. This fund is allotted by states with 90 per cent of it to be apportioned according to the population, and the smaller states receiving 1.5 per cent of the total.

To date, more than 100 requests for funds have been received from the New England States. Thirty have been approved in Massachusetts alone. The total value of the construction planned in water works in New England is estimated at nearly $3,000,000 based on the proposals submitted for funds to produce plans.

Medalist
Jos. A. McCarthy
Chief Chemist
Lawrence Exp't. Station
(Winner of Dexter Brackett Medal)

New Director
Jos. C. Knox
Engineer
Mass. Dept. Hlth.
Boston
(Program Chm'n Elected Director)

"Bill" Wickwire
President
Edson Corp.
Boston

Percy A. Shaw
Sup't of Water
Manchester, N. H.

E. F. Twomey
Lt. Col.
Supreme Hqtrs.
Germany

Thos. R. Camp
Consltg. Engr.
Boston, Mass.

Arthur C. King
Supt. of Water
Taunton, Mass.

Cooling Water and Stream Flow

Speaking on the subject of the "Cooling Water Benefits From Increased River Flow", M. LeBosquet, Jr., Senior Public Health Engineer, U. S. Public Health Service, Cincinnati, Ohio, pointed out that since 1939, the U. S. Pub. Health Service had cooperated with the Corps of Engineers, U. S. Army, on investigations of water pollution problems in connection with multiple purpose use of flood control reservoirs and other river developments.

It has been found that in many instances, industrial cooling waters when introduced into a stream of low flow, raise the temperature of the stream, thereby lessening its value as a cooling water and at the same time decreasing the oxygen content and lessening the ability of the stream to maintain aerobic conditions.

In such cases it would appear that flood control reservoirs or other impounding reservoirs which can store up water in one season and release it in the dry months, thereby increasing stream flow will have a beneficial effect on the cooling water uses of the stream. On the other hand, where cooling waters are discharged into impounded reservoirs, otherwise polluted, a septic condition and nuisance might result while at the same time the cooling value of the water may be impaired.

In studying this matter of cooling water uses from flowing and impounded streams, Mr. LeBosquet has developed two useful formulas for determining heat loss in Btu. per sq. ft. per hour for any given excess in temperature of water over air, provided the distance in miles downstream, the average stream width and flow in cu. ft. per sec. are known.

More heat is lost by a rapid shallow stream than by slow, sluggish streams, possible variations being from 18 to 6 Btu. per sq. ft. per hr. per deg. F difference in temp. between water and air.

Harry W. Dotten, Supt., Water & Sewerage, Winchester, Mass.
(Has served Winchester for 41 years)

Jas. D. Halwartz, Lieut., U. S. Engineers.
(Will return to Winchester Water Dept.)

E. C. Sanderson, Chairman, Water & Sewer Board, Winchester, Mass.
(Has served on Winchester's Water Board for 30 years)

No item of time appears in the formula which means that if the surface area is the same and the stream flow the same, it makes little difference whether the stream is 2 or 20 feet deep. In the deep stream, time between points will be much greater but the volume of water to be cooled will also be much greater.

Increasing the stream flow has two great benefits. It will reduce or eliminate the temperature-raising effect of a plant discharge on its own cooling water. Also the same Btu. contribution per day raises the temperature of the larger volume of water to a lesser degree, to the benefit of the downstream user.

On the other hand increased flow in certain ranges may not benefit all downstream users. When stream flow is very low, the time of flow between users may be so great that the effect of the upper industry may be entirely lost. Increasing the flow under these circumstances may bring hot water down faster than the heat is lost to the atmosphere.

In general financial benefits from reduced cooling water temperatures are not large enough to pay for more than a small fraction of the cost of an impoundment, but if impoundment is planned for flood control, navigation, or other uses, the cooling water benefits may be worthwhile additional justification for the project.

Prestressed Reinforced Concrete Pipe

Col. F. F. Longley, V. P. and Chief Engineer of the Lock Joint Pipe Co., East Orange, N. J., reviewed the history of concrete pipe in the water works field, citing the first use of concrete pressure pipe in Paris in 1890, and the use of 72-in., 48-in. and 36-in. reinforced concrete pipe for operation under low pressure head at the slow sand filter plant in Toronto, Can., in 1909.

Such installations as were later made at Salem, Mass., where the operating head was 20 ft., showed the weakest part of the pipe to be the joints. Then followed the lock-joint type of pipe. Because of the excellent carrying capacity of concrete pipe its use in water lines appeared warranted, and the next logical development was prestressing of the walls of the pipe. While prestressing was not new, prestressing of concrete pipe was a new idea.

First a shell of concrete is built up, either by forms, or by centrifugal casting. This shell is then wound with steel wire under great tension to prestress the concrete. And the steel cage thus produced is covered by an outer layer of concrete after curing is complete. For higher pressure work, the inner concrete shell contains a steel cylinder, but this cylinder is left out of prestressed concrete pipe operating on less than a 75 ft. head.

As the pressure inside the pipe increases, the compression stress in the concrete decreases, but the tension in the wire increases. As the pipe tends to decrease in size, after production, the stress decreases; therefore a 20 per cent excess stress is applied.

Water Supply in Latin America

In the absence of Clarence I. Sterling, Jr., Chief Engr., Division of Health and Sanitation, Office of Coordinator of Inter-American Affairs, Washington, D. C., the paper on "Water Supply Problems and Practices in Latin America" was read by Homer Hayward, Asst. Chief.

Programmers

Major M. Le Bosquet, Jr., Sanitary Engr., U. S. Public Health Service, Cincinnati, O.

Frank M. Ruffing, Engr., The Dow Chemical Co. (Magnesium Div.), New York

Col. F. F. Longley, Vice-Pres. and Chief Engineer, Lock Joint Pipe Co., Ampere, N. J.

Among the items of interest which the members of NEWWA heard was the fact that Latin American problems are acute because the earning power is less, water rates are lower, and materials more costly. Water plants are generally inadequate, and the quality of water discharged is lower than U. S. standards. In general, the water supplies of Latin America are about where ours were in 1900.

In the past South American practice in water supply has generally followed European practice and standards. One often finds cross connections of water and sewer lines, a high disease rate, small mains and pressures too low for adequate fire protection.

Unaccounted for water constitutes a large portion of the pumpage, 90 per cent of which is represented by water wasted in homes. The consumers just turn on the tap and let the water run. Supplies are often inadequate and water is frequently pumped into the system during only a part of the day. This causes back-siphonage to occur when the supply is shut off.

The Office of Inter-American Affairs began work in 1942 on environmental sanitation as one of its problems in connection with our war effort. To date there have been 61 water projects, 6 of which involved engineering studies, 44 of which were water supply, and 5 were treatment plants.

The work has been done on a cooperative basis in 18 countries, with the United States furnishing heads of field parties and the national government furnishing other personnel. Sixty-five Americans of whom 40 were sanitary engineers, mostly from the Sanitary Corps of the Army, have been engaged on this work.

As to the question of what benefit this program is to the U. S. now that the war is over, Mr. Hayward said there were two answers. First that the program will promote a better standard of living and purchasing power which will result in introducing American materials, while at the same time creating a market for them. Secondly, the program proposes to bring Latin American engineers to this country to study our modes and standards of engineering. Some 25 to 35 men are expected each year. This too will help to introduce American methods and materials into those South American countries.

As to the extent to which we are financing these projects, Mr. Hayward said that the U. S. is only putting in $1 to every $2 put in by the individual national governments involved.

Flow Measurement Devices

Mr. Leland K. Spink, of the Foxboro Co., Foxboro, Mass., read a paper on the "Choice of a Primary Device for Flow Measurement," in which he emphasized that complete consideration must be given to all features before making the final selection.

For example, in considering an orifice as against a Venturi tube, Mr. Spink asks "Is the head saved by the Venturi meter worth it in power costs?" On a larger pipe the Venturi may appear to be the best but all factors must be considered, nevertheless. While it is true that a Venturi will pass large objects which an orifice won't, it should

**Roger W. Esty, Supt., Water and Sewer Board, Danvers, Mass.*

Wm. James Caird Marshall, Supt., Water Dept., Georgetown, Mass.

**Geo. A. Sampson, Consulting Engineer, Weston & Sampson Engrs., Boston*

*(*Past Presidents of NEWWA)*

be remembered that except in the case of sewage, there will be no large objects in the line unless left there during construction.

A Venturi tube will pass 50 per cent more water at higher velocity but the orifice has the advantage of ease of making and ease of installation. Inasmuch as the two practically balance each other except at high velocities and with dirty water, the final choice may well be made on the basis of cost. The flow nozzle has characteristics similar to the orifice plate, while the pitot tube is advantageous only for spot measurements. The final choice will rest on consideration of the individual situation.

Cathodic Protection

In a paper on "Cathodic Protection of Pipe Lines," F. M. Ruffing, Magnesium Division, The Dow Chemical Co., New York, told of the history of cathodic protection dating back to Sir Humphry Davy in 1824. Sources of corrosion of pipe lines may lie in stray currents, or galvanic current caused by dissimilar metals, dissimilar soils or cinders. In galvanic corrosion, the spot where the current leaves the pipe is anodic or corrosive, while the spot where the current enters the pipe is cathodic, or protected.

The use of magnesium as a sacrificial anode to protect pipe lines from corrosion is predicated on the fact that it has an electro-chemical equivalent of 1000 ampere hours per pound and a solution potential to a Cu SO_4 electrode of from 1.7 to 1.6 volts. Zinc has an electro-chemical equivalent of 372 and a solution potential of 1.1 volts. Experiment showed the operating efficiency of magnesium electrodes to fall short of the theoretical 1000 amp.-hr. but research improved operation.

On one line of 41.5 miles of 8-in. gas pipe, twenty anodes, 1.3-in. in diameter and 6 to 10 ft. long, were used. The total drain was 6.3 amps. A backfill of lime slurry produced a current efficiency of 30 per cent. In another installation at Freeport, Tex., 14-lb. anodes were used at each gate valve station, with five to twenty anodes used at each location. The impressed voltage was 1 volt. These anodes were placed on 2-ft. centers at 2 ft. from the pipe and the top of the anode was at the level of the top of the pipe. The anode was attached to the pipe with a No. 4 copper wire, and the backfill around the anode was common salt. Changes in the water content of the soil could cause the current to drop from 6.6 amps. to 4.8 amps. in a clay soil of pH 6.4 to 10.8.

In the protection of a metal flume which conducts sea water to the magnesium plant at Freeport, 14-lb. anodes (4-in. in dia. and 18-in. long) were used with 3 milliamps. per sq. ft. of exposed surface. It was calculated that this protection would increase the life of the flume from an anticipated five to forty years.

The life of the anode will depend on its composition, the backfill around it, and the current density used. Local corrosion is a problem and for that reason the iron content of the anode must be kept very low. It is estimated that a 20-in. anode operating at 90 milliamps. with a 50 per cent current efficiency will last at least 10 years.

Mr. Ruffing gave some further information on anode specifications, anode ratings, anode life, backfills and preparation of backfills, as well as spacing of anodes. To date all experiments have been in connection with pipeline, but future experiments are contemplated on hot water tanks, standpipes and other structures.

From M.I.T.

Wm. E. Stanley, Prof. of Sanitary Engineering

F. Acevedo, Quintana, Cons. Engr., Riego Cia. (Eng'rs & Contractors), Caracas, Venezuela

Hugo Perez—L., Sanitary Engr. (eclipsed), Riego Cia. (Engrs. & Contractors), Caracas, Venezuela

Dr. Clair N. Sawyer, Associate in Sanitary Chemistry.

(Messrs. Acevedo and Perez are taking graduate courses in sanitary engineering at M.I.T. It is regrettable that Mr. Perez was blotted out by an imperfection in the film.)

Dr. Hodge to Head Mellon Paper Waste Research

Receives National Council for Stream Improvement Fellowship.

The National Council for Stream Improvement (of the Pulp, Paper and Paperboard Industries), Inc., has announced the appointment of Dr. W. W. Hodge, as Senior Fellow and Director of the Council's Multiple Research Fellowship at Mellon Institute of Industrial Research at Pittsburgh. Dr. Hodge will resign as professor of Chemical Engineering and Head of the Chemical Engineering Dept. of West Virginia University.

Dr. W. W. Hodge

Dr. Hodge will be in complete charge of all laboratory and field activities of the Mellon Fellowship which is entering its second year of research on the paper waste pollution problem. Dr. Hodge is a graduate of Ripon College in Wisconsin, and received his M.A. and Ph.D. at Yale University Sheffield Scientific School.

Pollution Abatement in Indiana

While the State of Indiana has issued orders to more than 40 municipalities or industries to abate pollution within the next 18 months, plans to reduce the pollution of Lake Michigan at Hammond, Ind., are going ahead without orders. According to Carl B. Carpenter, Supt. of the Hammond District, a cooperative arrangement has been entered into between the district and the American Maize Products Co. whereby the industry will reduce its waste load to a point where the waste can be treated in the sewage treatment plant. Reprocessing within the industrial plant will probably be the key to the reduction of waste load.

To date one municipality has complied with the orders to abate pollution, one has installed partial treatment, and 12 others including one industry have employed engineers to prepare plans for sewage treatment plants. No information is available on six other industrial plants or the other municipalities.

The abatement of municipal and industrial waste pollution about which we have been predicting a great postwar future, appears to be getting under way. We recently reported on steps in that direction in Pennsylvania and now we have this information on Indiana. We sincerely hope the trend continues.

Am. Soc. C. E. Inaugurate Public Relations Program

Col. Wm. N. Carey, Secretary of ASCE, has announced the inauguration of a public relations program by the Society. It is the intent of the Society to make the general public more familiar with civil engineers and their work both nationally and in their respective communities.

Allen Wagner

To conduct the program, Allen Wagner, public relations director of Minnesota Mining and Mfg. Co. of St. Paul, Minn., and a former newspaper man in that city, has been named as public relations assistant to Col. Carey. Mr. Wagner will carry on his work from the Society's headquarters, 33 W. 39th St., New York City.

MAINE WATER ASSN. MEETS IN BATH

Sees Destroyers Built—Feasts on Lobster—Hears About Water Works Law and Sewage Treatment.

ON OCT. 10th, on one of Maine's brilliant and exhilarating fall days, the Maine Water Utilities Assn. held its Annual Meeting in Bath, Me., the home of America's famed and historic Bath Iron Works, where boats have been built for many a year, but which became most famous during World War II for an astounding performance in speed of turning out destroyers of the class and quality which the accompanying picture typifies.

To this writer the feature of this particular Maine Water Utilities Assn. bi-monthly meeting was the tour through the destroyer-building part of Bath Iron Works under the guidance of men who knew the whole story of destroyer building and did a thorough job of describing the production and characteristics of the modern American destroyer and freely answering all but a relatively few questions. Most remarkable to this writer was the method developed by B.I.W. for producing the giant precision finished bronze propellers which are being produced at Bath at costs so low as to permit shipment of these huge screws cross-country to the Pacific Coast at an overall cost under that of propellers built on the spot in these distant ship building establishments.

Host
Maurice A. Libby
Supt.
Water District
Bath, Me.

Interestingly, the man credited with this accomplishment is the president of Bath Iron Works—a graduate engineer, and for 25 years also president of the Bath Water District. His name is W. S. Newell, known throughout Maine, in Washington, and to the horde of B. I. W. employes as just "Pete" Newell. When he attended the clam bake and lobster roast and later talked before the Association in an informal but stimulating manner on "American Industry Today and Tomorrow," we soon learned why so many can't tell you his initials and know this genius of production and practical applied engineering as just "Pete" Newell.

The Lobster Roast

We have mentioned the clam bake and lobster roast for which Maine is famed. For these clams and lobsters cooked over sea-weed out in the open—a la barbecue—the crowd seemed anxious (see pictures) and when served we soon found out why. We presume that Joe Larrabee of Bath has established a reputation for his baked clams and roasted lobster; if not, it won't be long. And whom did we unexpectedly run into at the feast but Roger Esty, superintendent of water and sewage at Danvers, Mass., and Mrs. Esty, who dropped in while on their vacation trip. And, then, too, "Bill" (W. J.) Downer, Chief Engr. of the Ill. State Dept. of Health, who learned of the meeting by reading *Water Works and Sewerage*, and just dropped over while visiting his folks, who now live in Maine.

Annual Meeting and Election of Officers

As this was the so-called Annual Meeting, members heard the report of the Secretary-Treasurer Earl Tarr of Winthrop, to the effect that the Association records reveal an average meeting attendance of 99 for its bi-monthly meetings; is in good shape financially, with a net gain of $603 for the year and $2,728 in the bank; has 290 active members and 23 supporting utilities in good standing.

As editor of the *Maine Water Works Journal* for the 13th year, "Sid" Anthony, of Augusta, reported that 540 copies of the Journal are distributed bi-monthly throughout Maine and also to members of the New Hampshire Association on a reciprocal agreement.

The following were presented by the Nominating Committee as the slate of 1945-1946 officers, and were elected unanimously:

President—David E. Moulton, Atty, Portland Water Dist'r.

Vice-Pres.—Jos. W. Randlett, Sup't, Richmond Water Dist'r.

Sec'y-Treas.—Earl A. Tarr, Sup't, Winthrop Water Wks.

Editor—Sidney S. Anthony, Sup't, Augusta Water Dist'r.

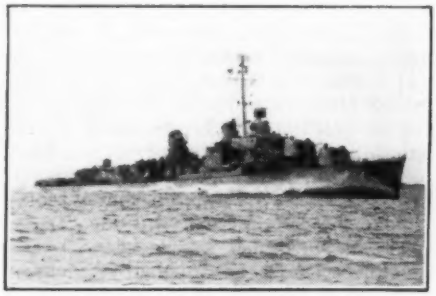
Trustees—"Lem" Smith, Sup't, Kennebunk Water Dist'r. Maurice Libby, Sup't, Bath Water Dist'r.

(Messrs. Moulton, Tarr and Anthony were re-elected to these offices long held by each—ever since MWUA was organized, in fact. Mr. Anthony was also chosen as chairman of the Program Committee for the year.)

Comm. on Sanitary Defects and Health Hazards Reports

Amongst the various committee reports, that of chief interest was the report and recommendation by the Committee on Sanitary Defects and Health Hazards on Public Supplies, presented by its chairman, Harry U. Fuller, and

Lobster and Clam Bake
Out in the open on a magnificent fall day in Maine. In the group we can spot Roger Esty from Danvers, Mass., and Mrs. Roger, who stopped by on vacation.



Pride of Bath
Product of the Bath Iron Works—the U. S. S. Frank Knox, 2,200-ton long hull destroyer. There were many more turned out like her, but the Japs knew that better than we.

One President to Another
"Dave" Moulton, MWUA's longtime president, chats with ace destroyer builder W. S. (Pete) Newell, president of historic Bath Iron Works.

Here and There During the Day

Secy. Earl Tarr selling lobster-bake dinner tickets to eager buyers.

Kelly of Northrup & Co. and "Al" Read of Bangor, from the rear. And who else?

W. J. Downer (right) and his "Dad," W. E. D., of Cape Elizabeth, Me. "W. J." State San. Engr. of Illinois, visiting his folks, heard about the meeting and just "dropped over."

"Mac" MacDowell, mgr., Biddeford-Saco Water Co., and "Herb" Crowell of Rensselaer Valve.

Had no interest in sewage, so outside for a gabfest — A. B. Thompson (Waterville), L. E. Little (Augusta), "Ted" Grindle (Bar Harbor).

strongly supported by the president of the Association and J. Elliott Hales, State Sanitary Engineer for Maine, as members of the Committee.

The report advocates that all public water supply systems be carefully surveyed for cross connections and hazards from possible back syphonage through sanitary fixtures into the water mains; that publicity campaigns be initiated to acquaint water customers, plumbers and others, of these dangers to water quality safety and practical measures for correction of defects; that rules and regulations of water utilities and plumbing codes be amended or revised so as to prohibit major cross-connections and effect corrections of existing hazards of clear-cut importance.

Then, the following important recommendations were made at the conclusion of the report which was endorsed unanimously by the Association, which also voted the Committee its appreciation and the necessary funds to continue its work.

Proposed Amendment to State Plumbing Code

By resolution the Association recommends the following amendment to the existing State Plumbing Code.

(1)—"If upon inspection it is found that a connection exists between a plumbing fixture, tank, device or appliance or between a waste outlet or a pipe having direct connection to waste drains, and the public water supply pipe or pipes in a manner to make possible the return of any of the water, liquid or waste in such units to the public water system by back pressure, gravity or backsyphonage; a notice in writing shall be issued by the State Bureau of Health, or its agent, to the owner of the property, or his agent, on which such connection has been found to correct such sanitary defect or health hazard within thirty days."

(2)—"If the owner of the property, (or his agent), to whom notice is given, fails or refuses to correct such sanitary defect or health hazard within the time specified, the State Bureau of Health (or its agent) shall request the public water utility serving the property, on which such sanitary defect or health hazard is found, to discontinue water service to such property until the sanitary defect or health hazard has been corrected."

Recent Improvements in Bath Water District

Under this title, Maurice Libby, Sup't. of the Bath Water District, told how the wartime water demand on Bath's water facilities had increased by practically 300% between 1940 and 1944 (1.45 mgd. in 1940 to 3.65 mgd. in 1944) while the population doubled to 20,000 and war industry accounted for the bulk of this increase.

He related how the distribution system and pumping facilities had to be strengthened and extended to meet the situation without regard to the hours of hard work, and without any labor troubles notwithstanding these hours of overwork. (*It was a case of "Americans for America" in Bath.—Ed.*) He proudly exhibited Bath's recently purchased and fully equipped scintillating Service Truck and a brand new one-ton Pick-up Truck.

Mr. Libby then described a serious water hammer situation, created by a war plant, which took water in gushes rather than steadily. He explained the simple solution of this problem which had split a pipe before correction. This method consisted of an air chamber constructed on the pumping station discharge main, built of 24-in. pipe, 12 ft. high and designed in accord with the design proportions given by Richard Bennett of Phoenix, Ariz., as published in the Reference & Data Section of *Water Works and Sewerage*—(June 1942) under the caption "Water Hammer Correctives." A comparison of pressure charts at the station before and after installation of the successful air chamber was all that was required to verify Mr. Libby's story.

Moulton on Water Works Law

D. E. Moulton, Portland Water District's astute counsel, presented an additional chapter of his compendium on "Water Works Law" which, when assembled, will constitute what appears to be the most comprehensive volume on the subject which has ever been produced. This chapter dealt with "Depreciation and Valuation"—one of the most important phases of water works accounting. In the several methods of taking into account depreciation, he pointed to the soundness of the so-called straight-line method which involves a deduction of scrap value from total value, which gives the residual wearing value. This value divided by the remaining years of estimated life provides the correct figure for depreciation charge-off for the year. The question of total value vs. going value vs. replacement value remains as the focal point of discussion, while total value is the truly sound base for depreciation calculations after charging off the reasonable scrap value. Reproduction value is a fleeting value and too subject to change. The U.S. Courts once favored reproduction value as proper but corrected this mistaken choice of factor in utility valuation proceedings. The sinking fund method, said Mr. Moulton, is favored by some but is lacking in basic soundness when compared to the so-called straight-line method.

(We cannot expect to do justice to Mr. Moulton's discussion in this digest and wish to recommend that all interested readers communicate with S. S. Anthony, Editor of the Maine Association, with respect to securing a complete file of Mr. Moulton's several installments of his discussion of the important topic, Water Works Law in America. These chapters are worthy of special publication as a reference text in our estimation and we hope that this may materialize in the end.—Ed.)

Camp on Modern Sewage Treatment

We believe that the illustrated talk on "Modern Sewage Treatment" by Thos. Camp, Consulting Engineer of Boston, constitutes the first discussion of sewage treatment ever to appear on the Maine Water Utilities Ass'n. program. Mr. Camp, formerly Professor of Sanitary Engineering at Mass. Inst. of Technology, presented an illustrated discourse on sewage treatment practices and facilities of today—the role of the various methods—their accomplishments and short-comings. For the uninformed, his general lecture accomplished the intended purpose. Many who anticipate the day when sewage disposal will be consolidated with water supply found considerable interest in this lecture.

WATER TREATMENT TO REDUCE CHEMICAL ODORS*

Experience With Various Methods at Nitro, W. Va.

By LAWSON HAYNES and WALLACE GRANT
Plant Superintendent Chemist
WEST VIRGINIA WATER SERVICE CO.
CHARLESTON, W. VA.

THE Nitro water purification plant of the West Virginia Water Service Company was built during World War I to serve the city, which manufactured explosives, with domestic and industrial water. It also furnished fire protection. The original plant was built for 40-mgd. capacity (Fig. 1). The original basins, filters, clear wells and pipe system connecting the same are still in operation today. However, since the daily output is now approximately only 3 mgd., the size of the pumps has been reduced and the filters are rotated for use periodically.

The raw water pumps have a capacity of 4,000 gpm. each and operate singly for approximately thirteen hours per day. Raw water is not pumped during the rest of the day. The raw water pump delivers water to a raw water pit and from there to the aerator pump at the influent of the 10-mil. gal. basin. The aerator pump delivers 4,000 gpm. through the aerator at 55 psi. When the basin reaches a certain elevation, the raw water pump is stopped and a check valve at the effluent of the basin opens to permit the basin water to feed back into the suction of the aerator pump which continues to operate for the full 24 hours. This permits some of the water to receive double aeration. Either or both of the basins may be bypassed and the water carried direct to the filters by using stoplogs.

High Pressure Nozzle Aerator, Nitro, W. Va.

Two filters are in use for about 20 hours per day until the loss of head becomes great enough to necessitate washing. Then two clean filters are placed in service after which the two dirty filters are cleaned, refilled and held in reserve. By this method all filters are maintained in operating condition.

Filtered water flows by gravity through one of two 6-ft. wood-stave pipelines from the 600,000-gal. clear well to the 5-mil.gal. clear well. The latter is maintained full or nearly so at all times.

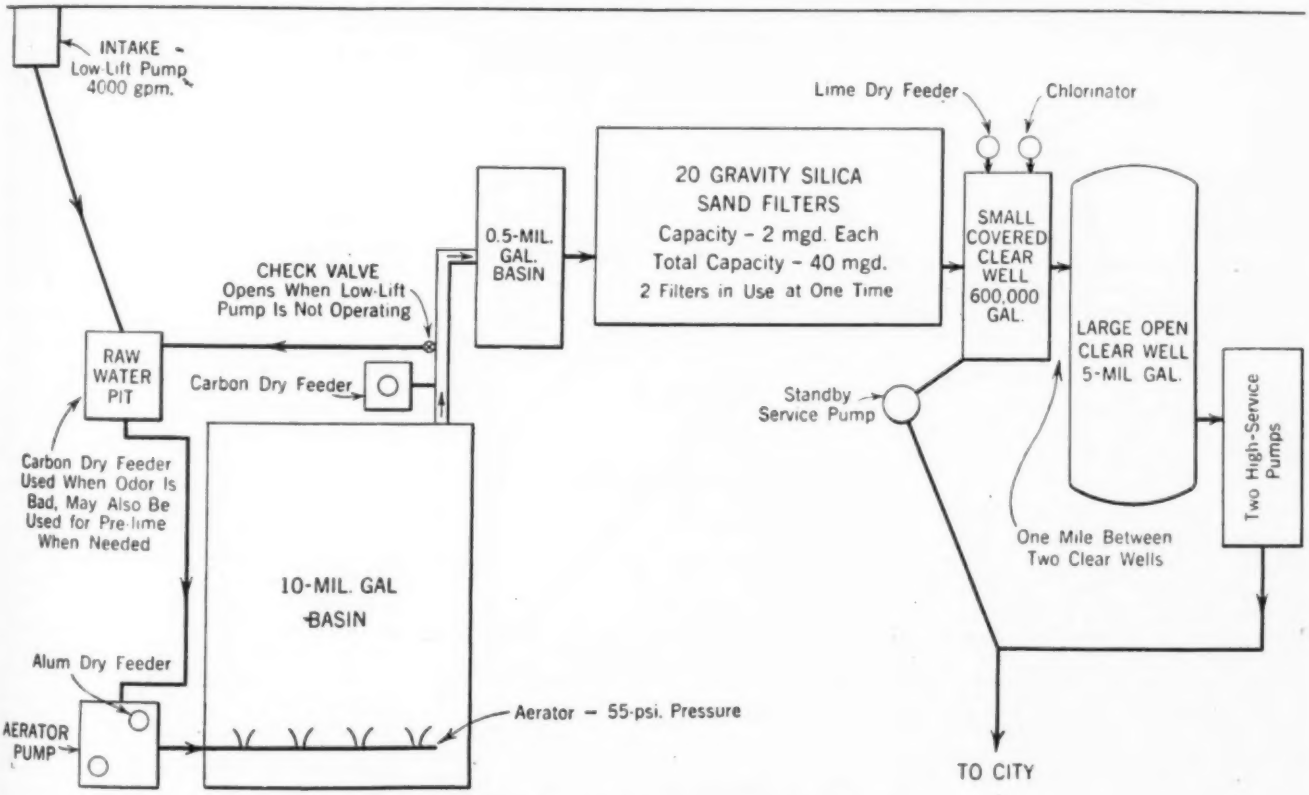


Fig. 1—Flow Graph, Nitro, W. Va., Filter Plant.
(Single aerator piped to permit aeration of alum-treated water, and same water reaerated leaving primary basin.)

* This paper, read before the W. Va. Section of AWWA, is here reproduced by permission of the Association.

(An article intended for our strike-bound October issue.)

Chemical Dosages

The chemical dosage varies as the condition of the raw water changes. There are, however, no great changes except for the chlorine and carbon. During the months of low flow the chlorine demand is excessive because of the nitrite content of the raw water. The threshold odor value of the raw water determines the carbon dosage. Carbon is fed continuously in varying amounts to the effluent of the 10-mil.gal. basin. Carbon is fed to the raw water before aeration when necessary. The carbon dosage to the 10-mil.gal. basin effluent is so located that when the raw water pump is off and the water in the basin is recirculated, carbon is applied to the 10-mil.gal. basin, thereby helping to reduce the odor further and to keep down algae growths.

Chlorine is applied to the 600,000-gal. clear well in sufficient quantities to maintain a residual of 1.0 ppm. through the large clear well.

Lime is also applied to the first basin for final pH correction.

The source of supply for the Nitro plant is the Kanawha River. Upstream from Nitro are numerous large chemical plants which discharge industrial wastes into the river. As a result the Kanawha at Nitro has some chemical odor even in flood stage, while in periods of low flow the concentration of odor-producing substances in this water is almost beyond belief. A threshold odor number of 6,125 was recorded on several occasions during the summer and fall of 1944. The lowest threshold odor found for the supply in the past two years was 19 on Jan. 4, 1945.

In November, 1944, a mineral examination of Kanawha River water revealed:

	ppm.		ppm.
Chloride	52	Free Carbon Dioxide	10
Nitrate	4.4	Iron	0.14
Sulfate	33.6	Manganese	Trace
Calcium	32.5	Hardness, as $CaCO_3$	101
Magnesium	4.7	pH	6.7
Sodium	19.6		
Alkalinity—M.O., as $CaCO_3$	33		

Monthly average threshold odor numbers on Kanawha River water at Nitro for the year beginning May, 1944, were:

1944		1944	
May	188	November	1,435
June	743	December	124
July	1,539	1945	
August	942	January	42
September	4,300	February	78
October	2,179	March	317
		April	1,055

Water from Coal River, which empties into the Kanawha River at St. Albans, furnishes water to the St. Albans purification plant of the West Virginia Water Service Company. Coal River water is of excellent quality, so that during the winter and spring months there is no trouble with odors at that plant. In the summer and autumn months of low flow, however, the Kanawha River water backs upstream into the Coal River, creating odor problems as bad as, and sometimes worse than, those in Nitro. The highest threshold odor number ever determined at the Charleston laboratory of the West Virginia Water Service Company was 8,333. This was on a river sample from St. Albans collected on Sept. 7, 1944.

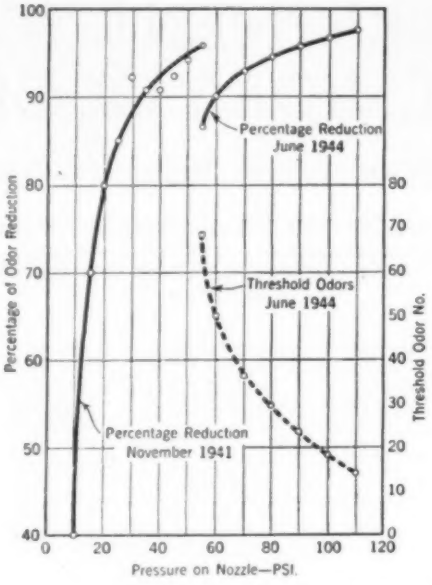


Fig. 2—Reductions of Threshold Odor of Kanawha River Water at Various Nozzle Pressures with 2-in.. Spraco Nozzle.
(Raw-water threshold values Nov., 1941 = 1,660; June, 1944 = 500)

Continued operation of the two plants using this supply made it necessary to devise a method of either removing or greatly reducing this odor. This work was started in 1935 when odor was first encountered in any serious measure.

ODOR CONTROL

A plan of treatment using aeration and activated carbon operated with considerable success until the summer of 1943. Until that time the odor could best be described as "sweet-chemical." The opening of a synthetic rubber plant and a butadiene plant above the intakes at Nitro and St. Albans, along with increased industrial wastes from other chemical industries rushed with war work, has made this problem acute in the past two years. At the same time the odor changed to an unpleasant one, smelling like varnish at times and at other times like mustard.

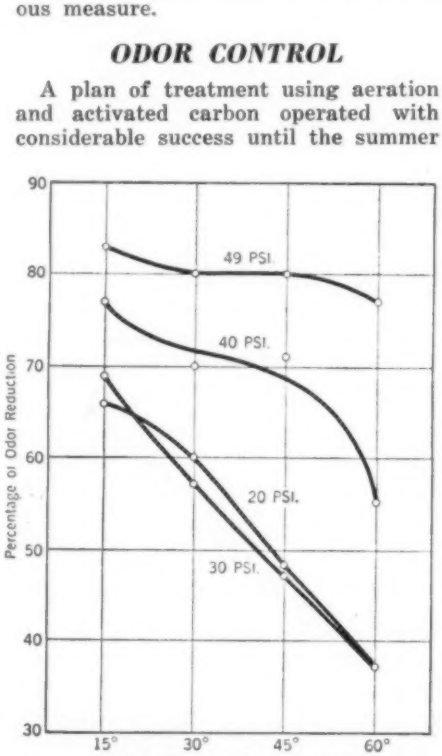


Fig. 3—Reductions of Threshold Odor of Kanawha River Water at Various Nozzle Pressures and Various Inclinations of Nozzles.

Three methods of odor reduction have been investigated, some results of which are reported below.

Break-Point Chlorination

A series of laboratory experiments and one plant-scale test have been conducted to determine the efficiency of break-point chlorination as a means of odor reduction in Kanawha River water. Ammonia nitrogen concentration is 4 ppm. or more in the summer and autumn months. Break-point chlorine demand ranges from 3.5 ppm. in the winter to 46 ppm. or more in dry months.

Aerated raw water was used for the laboratory break-point and combined odor tests. One-half of the sample was retained as a control and the other half chlorinated about 1.5 ppm. above break-point. Both portions were then allowed to stand for a contact period which varied with different samples from two to 22 hours. After the contact periods, threshold odors were detemined on both portions. The chlorinated portion was not de-chlorinated. In all cases the threshold odor numbers of the two portions of any particular sample were the same or very nearly so.

Break-point chlorination on a plant scale was tried at Nitro from Apr. 28 to May 2, 1944. Chlorine was added to the filtered rather than to the raw water for several reasons: (1) This required no change in chlorinating equipment, as chlorine is normally fed at this point. (2) Because this water had to pass through the 5-mil.gal. clear well, ample contact time was assured. (3) By chlorinating the raw supply it might have taken over a week to get a free chlorine residual through the 10-mil.gal. basin.

Chlorine was added to the small clear well at the rate of from 8 to 10 ppm. during the hours of filtration on these days. By May 2, a free chlorine residual of 1.3 ppm. was found in the plant effluent. Throughout the test the odor number of the filtered water, before chlorination, was 12. On May 1 the odor number of the plant effluent was 5, while on May 2, the first day to show free chlorine, it was 12. Since no odor reduction was found from this test or in the laboratory experiments, it was concluded that break-point chlorination reduces this type of odor very little or not at all.

Activated Carbon

From plant experience and laboratory tests it has been found that beyond a certain point the addition of more ac-

tivated carbon removes little odor and certainly is not economical. At one time, before the introduction of double aeration, the rate of feed of carbon at the St. Albans plant was over 340 ppm., and this did not solve the odor problem by any means. For the rest of the period preceding double aeration, 170 ppm. was not an uncommon dose.

In one laboratory test aerated raw water from the St. Albans aerator was treated with varying amounts of Aqua Nuchar up to 850 ppm. A little alum was added and a contact period allowed equal to that in the basins at St. Albans. Results were as follows:

Activated Carbon lb./mil.gal.	Threshold Odor Number After Treatment
0	420
1430	124
2145	62
2860	41
3575	15
7150	6

Filtration of the finished water through granular activated carbon filters has received attention. Two 1-gal. jugs were arranged as upflow filters and set to run 24 hours per day, using Nitro finished water. Jug No. 1 contained 1 lb. 1 oz. of granular Nuchar carbon; No. 2 contained 2 lb. 14 oz. of Darco granular carbon. The results in the tabulation below were secured before the jugs became clogged beyond repair and it became impossible to operate the filters any longer. The flow was controlled so that it would about equal a flow of 0.6 gpm. if this same amount of carbon were placed in an ordinary filter to a depth of 18 in.

Date	Threshold Odor Values Nitro Service Pump	Effluent Jug No. 1	Effluent Jug No. 2
Oct. 10, 1944	25	0	0
Oct. 17, 1944	60	0	0
Oct. 25, 1944	21	0	0
Oct. 31, 1944	13	0	0
Nov. 10, 1944	70	0	4
Nov. 15, 1944	80	0	5
Nov. 21, 1944	60	4	6
Nov. 28, 1944	19	0	2
Jan. 10, 1945	4	0	0
Jan. 17, 1945	4	2	0
Jan. 25, 1945	8	0	0
Feb. 7, 1945	50	11	—
Feb. 15, 1945	60	8	—
Feb. 20, 1945	9	5	—
Mar. 6, 1945	3	2	—
Mar. 14, 1945	4	2	—
Mar. 21, 1945	40	10	—
Mar. 27, 1945	25	10	—
Apr. 5, 1945	8	4	—

The conclusion is that granular activated carbon is valuable in reducing the last fraction of odor after the bulk has been reduced by aeration.

Pressure Aeration

Aeration by high pressure has been found to be by far the best means of reducing the chemical odors encountered in Kanawha River water. As much as 98 per cent of the odor has been removed by a single aeration at 110 psi. at the nozzle of the aerator.

The aerator at Nitro was designed by and constructed under the supervision of J. R. Peck, engineer in charge of the Nitro plant. It consists of 30 No. 11-BA 2-in. Spraco nozzles arranged along a pipe which decreases in diameter in calculated steps from 18 to 8 in., so that practically the same pressure is found at all nozzles. The pumping expense for a single aeration

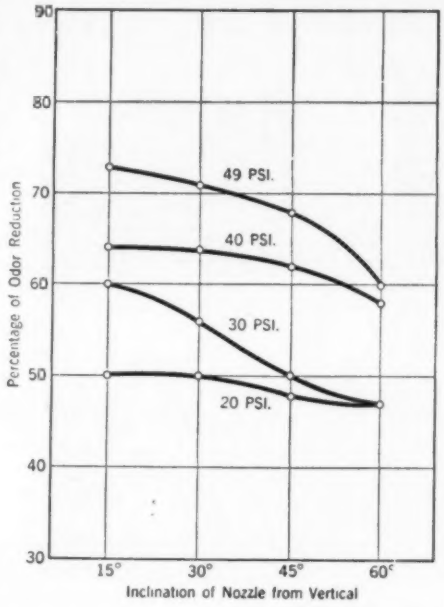


Fig. 4—Reductions of Threshold Odor Values Through Second Aeration of Aerated Alum Treated Raw Water After Passage Through Primary Clarification Basin.

(A study of various nozzle pressures and nozzle inclinations. Threshold value of aerated clarified water = 313.)

at 55 psi., according to Mr. Peck, is less than the cost of applying 17 ppm. of activated carbon.

When odor is present in the supply at St. Albans, the water is aerated twice. The first aeration is of the raw water through five 2-in. Spraco nozzles

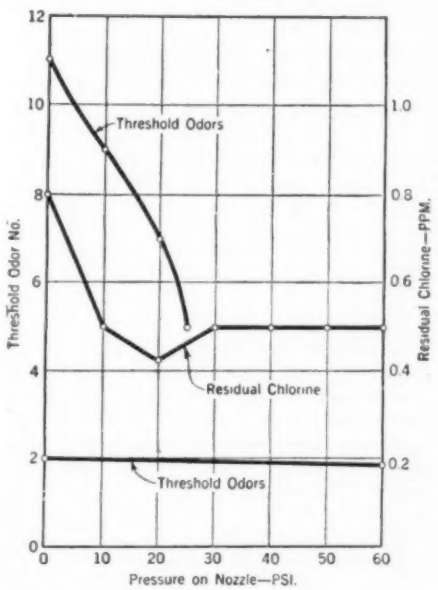


Fig. 5—Reductions of Threshold Odor Values and Observations of Accompanying Dissipation of Residual Chlorine at Various Nozzle Pressures.

(Test made on filtered chlorinated plant effluent. Note parallel pattern of chlorine loss, and threshold odor value reduction curves. Note also indication of "volatile" and "fixed" residual chlorine forms — approximately 50% of each.)

with about 30 psi. pressure from the intake pump. Because of lack of space this aerator has four sides boarded up. There is no evidence that this has led to any serious decline in its efficiency.

A second aerator, constructed at St. Albans late in the summer of 1943, picks up the treated water at the end of the first basin and aerates it at about 30 psi. This water then flows into the second basin. Three sides of this aerator are boarded up.

Efficiency of Pressure Aeration

Experiments to determine the most efficient method of operation for high-pressure aeration have been conducted in the past four years. In the fall of 1941 an experimental aerator, using a single 2-in. Spraco nozzle, was built at Nitro. Odor tests were run on the raw water and on samples from the aerator using pressures of from 10 to 55 psi. in 5-lb. steps. The threshold odor number of the raw water was 1,660, ninety-five per cent of which was removed at the 55 pound pressure. This sample had a threshold odor number of 75 (Fig. 2).

Treatment of this sample with activated carbon resulted as follows:

The threshold odor was reduced from 75 to 10 by 34 ppm., to a threshold of 5 by 68 ppm., to 4 by 103 ppm., and to 2.5 by 137 ppm.

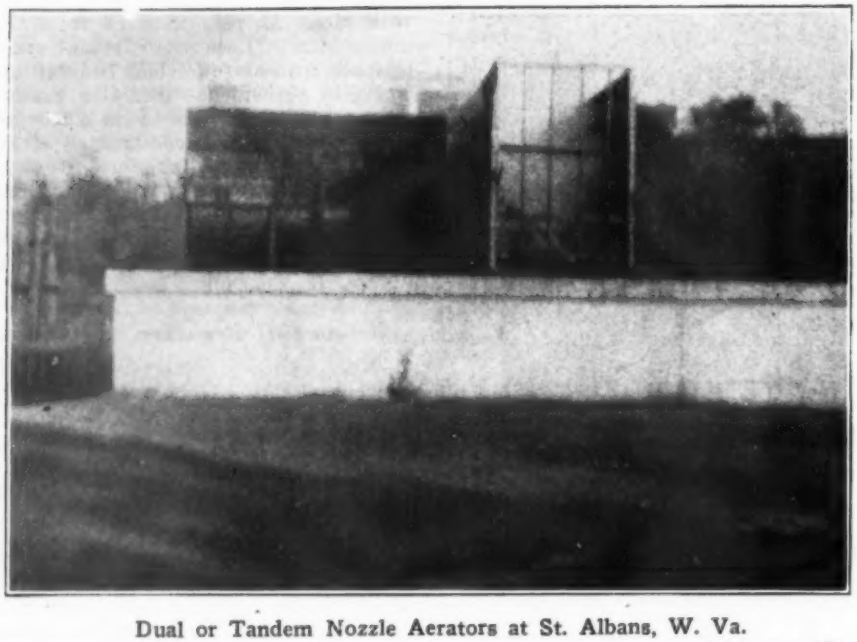
The present aerator at Nitro was built as the result of this experimental work and its use, together with carbon, served to eliminate most of the odor in the water until the summer of 1943.

Under present war time odor conditions of the river, substantial amounts of odor are removed by raising the pressure on the aerating nozzle from 55 to 110 psi., which is the highest pressure so far tested. This was demonstrated in May, 1944, when, on a special one-nozzle aerator, odors were determined on samples of from 55 to 110 psi. The raw river water had a threshold of 356 which in the 55-psi. sample was reduced to 31. The odor dropped consistently with an increase in pressure until the 110-psi. sample had a threshold of 7, representing a removal of 98 per cent.

About the same results were secured when this test was repeated in June. The river odor of 500 dropped to 14 in the 110-psi. sample (Fig. 2).

Trial runs were made at the Nitro aerator in September, 1943, to determine if any position of the nozzles, other than vertical, would give better odor reduction. Kanawha River raw water, to which 17 ppm. of alum had been added, was used. Nozzles were slanted off the vertical at 15, 30, 45 and 60 deg. Samples were taken at 49, 40, 30, and 20 psi. pressure. Best reduction in the odor was secured at 15 deg. and at 49 psi. This reduction was 83 per cent, but at the same pressure and at 60 deg. it had dropped to 77 per cent. In general, the more nearly vertical the nozzle, the better was the efficiency. Fig. 3 shows these results.

A second aeration of once-aerated and settled water from the 10-mil.gal.



Dual or Tandem Nozzle Aerators at St. Albans, W. Va.
(Aerator on left aerates alum-treated raw water; that on right provides second aeration to clarified water to filters.)

primary basin at Nitro was also the basis of a series of odor determinations (Fig. 4). The threshold odor of the once-treated water was 313. What the odor of the raw water was before treatment was impossible to determine because the water in the basin was a mixture of several days' pumping, and what percentage of one or the other day's flow was present could not be calculated. Odor tests on the raw water at that time, however, indicated an odor number between 800 and 1,000.

Aeration of this once-aerated water reduced the odor less, on a percentage basis, than it did in the case of raw water. The fraction of odor remaining appeared to be of a type more difficult to remove. Best results were obtained at 49 psi. and at an inclination of 15 deg. This sample showed a reduction of 73 per cent. Estimating the original odor of the raw water at 833, the total reduction by double aeration plus 34 ppm. of activated carbon being fed to the basin at that time (see Fig. 1) was 90 per cent. Compare this reduction with that secured in 1941 when a single aeration at 50 psi. removed 94 per cent.

As the odor is reduced step by step, it becomes increasingly difficult to effect a reduction in the next step. Aeration of the plant effluent, using the water from the large second clear well, was tried in April, 1944. With a threshold of 11 and the characteristic sweet chemical odor, this was reduced to a threshold odor of 9 at 10 psi., 7 at 20 psi., and 5 at 25 psi. (Fig. 5).

Aeration Reduces Residual Chlorine Only Slightly

Aeration of water from the second clear well was tried again when the odor was only 2 (Fig. 5). In this case there was almost no odor reduction even at 60 psi., which sample had an odor number of 1.8. Incidental to this investigation was the finding that aeration does not greatly reduce the residual chlorine in water. Before aeration this water showed 0.8 ppm. residual chlorine when tested by orthotolidine with a five-minute contact period. After aeration in steps of 10 psi. to 60 psi. all samples, except one, had a residual chlorine of 0.5 ppm.

A problem encountered in high-pressure aeration is the abrasion of the diffusion vanes, or turbine center, of the nozzle. Abrasion is worse when the river has considerable turbidity. A few tests were run to see if these centers could be inverted or eliminated. With the turbine center inverted to give a high spray, a sample at 53 psi. had a threshold odor of 70. When the turbine center was in the normal position and at 55 psi., and other conditions were the same as above, the odor number was 68. Other results showed that little or no change occurs when the turbine center is reversed. At about 90 psi. the same reduction was observed with the turbine center actually removed as with it in. It is impossible to draw any general conclusions from these few tests, which were not repeated.

Because of the efficiency of high-pressure aeration in removing high percentages of these chemical odors, it must not be assumed that the same results can be obtained with odors of other types. In the second week of September, 1944, a musty odor was observed in the raw water at Nitro. In spite of aeration at 55 psi. and the addition of 34 ppm. of carbon, it was not entirely eliminated and could be detected in the finished water.

On very cold days the Nitro aerator cannot be used because of the ice which builds up around it. Fortunately there are few days cold enough to cause trouble at Nitro.

[*Note: All threshold odor numbers reported here were determined at room temperature. Checks on the same samples at room temperature and at 60°C. have shown that the latter odor numbers are usually considerably higher.*]

Customers Pay Less for Water in Cold Weather

We wonder whoever thought this one up? In the New York *Herald Tribune* our eye caught this headline and what follows:

"It probably won't affect your water bill to any noticeable amount, but householders get more water for their money when the water is cold. At 39.2 degrees Fahrenheit they get the most water for their money because water is most dense at that critical point, and expands as it becomes warm or colder."

This little item brings to mind a thought long held in the back of our head. For refrigeration purposes the customer is really buying units of heat deficiency—not water at all. Therefore, why shouldn't a rate structure for refrigeration water be built on the units of "negative heat" supplies. The latter would be figured from the meter reading multiplied by a "heat deficiency" factor based on the average water temperature for the billing period.

Toman Opens Consulting Office

Lt. Col. George Toman, formerly of the Engineering Division of the N. Dak. Dept. of Health, is out of the armed services which he joined in March, 1941. Col. Toman has opened a consulting office in Mandan, N. Dak., and will specialize in municipal water and sewage treatment.

W. Va. State Water Commission Reorganized

The 1945 session of the State Legislature created a five member State Water Commission consisting of the Commissioner of Health, the Conservation Commissioner and three other members to be appointed by the Governor with terms of two, four and six years.

The Governor, in making his appointments, selected a representative of a large industry, the manager of the Chamber of Commerce of the largest city in the State and a prominent attorney.

At an organization meeting held September 5, 1945, Mr. Walter A. Buchanon, Manager, Huntington Chamber of Commerce, was elected Chairman and Mr. J. B. Harrington, Secretary.

SIXTH ANNUAL MEETING WESTERN PENNA. SECT. AWWA

Holds Joint Session with West Div. of Penna. Water Works Operators' Association

WITH 150 registrants attending, the Western Pennsylvania Section of AWWA held its first post-war meeting at the Roosevelt Hotel, on Sept. 14, in Pittsburgh, Pa.

New Officers

Elected to serve for the ensuing year were the following officers:

Chairman

D. E. Davis, Cons. Engr., The Chester Engineers, Pittsburgh, Penna.

Vice-Chairman

L. S. Morgan, Dist. Engr., Penna. State Dept. of Health, Greensburg, Penna.

Secy.-Treas.

Earle P. Johnson, Wallace & Tiernan Co., Inc., Pittsburgh, Penna.

Trustees

E. C. Goehring, Asst. Mgr., Beaver Falls Munic. Auth., Beaver Falls, Penna.

T. G. Braman, Mgr., Citizens' Water Co., Washington, Penna.

Richard D. Hoak, Senior Fellow, Mellon Institute, Pittsburgh, Penna.

OPERATING AND MANAGEMENT PROBLEMS

The meeting was called to order by Chairman Edw. C. Trax, Supt. of Filtration, City of McKeesport, Penna. Water Dept., and the first technical session was turned over to the leadership of R. B. Adams, Chemist, Penna. Water Co., Wilkinsburg, Penna.

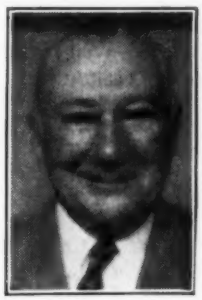
Mr. Adams said that problems had been submitted by members of the section. These problems were then put to various other members, who prepared papers on the subject.

A Problem in Bacteriology

Each Spring, and late Fall again, when the temperature of the water is changing rapidly, Miss Marie A. Murphy, Chief Analyst, Pittsburgh Filtration Plant is confronted with "A Problem in Bacteriology." For then she finds, in the distribution system, an organism that defies bacteriological classification.

This organism grows in an atypical colony, on solid media, produces but a bubble of gas in 24 hours and less than 10 per cent in 48 hours. Even enrichment doesn't help. When subjected to differentiation tests it appears to be B. Coli communis but if it is coli, why is it E.M.B. negative and if it is not coli why does it ferment lactose, asked Miss Murphy.

This problem was put to C. K. Calvert, Supt. of Filtration at Indianapolis, Ind. Mr. Calvert was unable to be present at the meeting but his prepared remarks were read by Prof. Harold Lang, of the Dept. of Biology and Public Health at Carnegie Institute of Technology in Pittsburgh. Mr. Calvert said that, strictly speaking, the organism met the definition of coliform bacteria, but he questioned the source as being from water. Could it have come from an air borne source and have been introduced into an open reservoir? Calvert suggests that bacteria in mains mean regrowth of organisms that pass the treatment plant or re-infection. Calvert also suggested that tryptose-lauryl sulfate broth be tried as a confirming medium.



Chairmen

Incoming	*Outgoing*
D. E. Davis	*Edw. C. Trax*
Cons. Engr.	*Chemist*
The Chester Engrs.	*Filtration Plant*
Pittsburgh, Pa.	*McKeesport, Pa.*

Dr. Lang also made some comments, pointing out that the coliform group is not a single organism but is a group with Escherichia Coli communis on one end giving typical results in both liquid and solid media; on the other end is an organism which ferments both lactose and saccharose. The latter is Aerobactor aerogenes, which Dr. Levine claims is not significant. Dr. Lang emphasized the fact that bacteria mutate, and change their characteristics, and what is needed, therefore, are better definitions. Furthermore, Dr. Lang says it is a fairly safe rule to say that unless a suspected coliform organism is found with a high plate count it is probably not significant. This rule may not, however, apply to bacteria found in treated waters.

Baffling Sedimentation Basins

After seeing the design of the particular plant described in the paper on "Baffling Sedimentation Basins" by R. W. Haydn, Chemist, Suburban Water Co., Oakmont, Pa., the audience were convinced that that basin, with or without the baffles, would baffle anybody.

To make matters worse, this particular plant, designed for an output of 2.5 mgd., was actually called on to supply 3.5 to 4.0 mgd.

The water enters a mixing chamber where the coagulant floc is produced, then passes to a primary sedimentation tank, from which the water flows to a second mixing tank where other chemicals are added, and then to a secondary settling tank which contains two underbaffles and one overbaffle, the three spaced at the quarter points.

At the higher rates, the floc passes through the first sedimentation basin, is broken up on passing into the second mixing chamber, but reforms as a dense floc. On passing to the secondary sedimentation tank the high velocity again breaks up the floc. Through the first half of the second sedimentation tank there is no decrease in turbidity but fair sedimentation is effected in the latter half. At normal turbidities in the raw water the turbidity of the water going onto the filters was only 4 to 10 ppm. At higher raw turbidities, the turbidity of water going onto the filters was 25 ppm. Considering the layout and conditions existing, these results could not be considered poor.

Wm. J. Murdoch, Sanitary Engineer, Pittsburgh, discussed the design features of a good sedimentation system and then commented on the plant at Oakmont from the standpoint of these features.

Good design, according to Mr. Murdoch, must consider, not only gravity, but also convection currents, coalescense, biological activity, velocity, and viscosity of the water. While in theory sedimentation takes place in a block of water that moves through the tank, actually that is not so.

Good design, must therefore consider the following factors among others: Inlet, velocity of flow, piping layout, distribution, baffling of inlet and outlet, physical features, outlet, and withdrawal system.

Referring to the Oakmont design, Mr. Murdoch suggested the need for multiple inlet openings. The baffles which exist at the inlets of the settling tanks, while they have several openings, still cause too high a velocity (greater than 1 ft. per sec.). These baffles short circuit because of inlet design. The outlet creates a tendency to lift and break the floc because of the velocity and turbulence.

At Oakmont, the two mixing tanks cause the creation of the floc twice.

Each time, however, it is broken down because it enters the sedimentation tank at rates of more than 3 ft. per sec. through two 12-in. pipe openings.

Moreover, the inlets are at the corners of the tanks which gives more flow to one side than the other. At the sedimentation periods existing, the linear velocity through the tanks is 3.4 ft. per sec. Where the water passes over and under the baffles in the secondary tank the velocity is 4 ft. per sec. Baffles, said Mr. Murdoch, are good only in cold water or when there is a change in temperature, for only then do they prevent the density currents caused by temperature differentials.

The outlet weir, being submerged, did not act as a weir at all but actually

Officers

Vice Chairman	*Secy.-Treas.*
L. S. Morgan	*Earle P. Johnson*
Pa. Dept. of Health	*Wallace & Tiernan*
Greensburg, Pa.	*Pittsburgh, Pa.*

allowed short-circuiting nearest the final drawoff pipe. Pointing to the Oakmont layout and design, Mr. Murdoch, suggested that for proper design, an engineer should first have common sense, secondly should make observations on operating conditions, and lastly incorporate correctives into his design to prevent operating difficulties that often occur.

Foreman Training

W. B. Simpson, Director of Training, Hope Natural Gas Co., Clarksburg, W. Va., spoke on **"Foreman Training as an Important Step Towards Better Management-Employee Relations"** and said that a foreman must be inspired and in turn inspire his men. Furthermore, the foreman is the man who must get out production, while at the same time being cost conscious, maintaining a safety record and acting as the diplomatic representative of both labor and management.

It is only reasonable that the foreman will need some training to handle this complex assignment. The Training within Industry program of the government has prepared a series of pictures which show how a foreman should go about the job of keeping in touch with his men and instilling in them the proper attitude toward their work. Basic principles of the "Contact Plan" by which foremen may accomplish this desired result are these:

Study the man.
Plan the talk.
Be friendly.
Choose the Proper Time and Place.

In training a foreman on how to carry on this contact plan, he must be taught how to handle a grievance (preferably called a problem), how to reprimand, how to talk improvement, how to teach new workers, and in addition he must be taught the policies and plans of the company. When the supervisory discussion plan has the backing of management, the labor-management problems of the industry will decrease markedly.

[The water works industry being essentially a monopoly within a community, and being relatively small compared with large production industries, may not have the foreman problem, or the labor problem of the large industries. Nevertheless, the fundamentals of this foreman training idea may be applied even in the smallest water (or sewage) plant. G. E. S.]

Determining Ferric Sulfate Dosage

Without benefit of props or demonstration materials, J. B. Nickel, of the Tennessee Corp., Atlanta, Ga., told how to run a **"Jar test for determining the chemical dosage of coagulants."** This test is one of the most frequently used and at the same time most frequently misused tests in a water works laboratory according to Mr. Nickel. The important factors in the jar test are Time of Mix, Speed of Mix, Size of Jar, and Temperature of Test.

In preparing stock solutions of ferric sulfate, remember that weak solutions of $Fe_2(SO_4)_3$ are not stable. In all cases it is best to use distilled water, and weigh out the amount of ferric salt required. Add the salt to the water and heat to 160° F. for five minutes, then dilute this solution to the strength of the standard solution desired. It is best to make a stock solution of greater than 10 per cent and dilute as desired.

Tests should not be run in the sunlight, and if possible the jars should be immersed in a water bath of the same temperature of the water being flocculated. The shape of the jar is not particularly important so long as the same shape is used in comparative tests. At least one liter of water should be used; to use less will give erroneous results, while to use more is generally awkward. The velocity of stirring should be the same in any comparative tests.

One thing that should be remembered is that it is impossible to compare the jar tests at one plant with those at another, but at any one plant jar tests are invaluable from day to day.

As to the stirring velocity, in many instances it has been found that a rapid stir (100 rpm.) for three minutes followed by 20 minutes of mixing at 20 rpm. gives the best results. Indianapolis, Ind., however, has found it necessary to use four different speeds in conducting jar tests.

Jar tests should be calibrated to plant operation at the different seasons to give the best results. The order of the addition of chemicals in a jar test should be the same as the order of addition in the plant. It is important to add the chemicals to all of the jars at the same time. If this seems like an impossibility, Mr. Nickel suggests that the reagents be measured out into small beakers and placed directly in front of the jar to which that amount is to be added. Then at the proper time pick up two beakers at a time, one in each hand, and dump them rapidly. Six beakers of reagents may be added to the respective jars in a matter of seconds in that manner.

In the carrying out of jar tests, it is wise to run two sets, the first with large incremental doses, and the second with smaller increments within the best range shown by the first series.

Baffling Programmers

R. W. Haydn	*Wm. J. Murdoch*
Chem. Water Co.	*Cons. Engr.*
Oakmont, Pa.	*Pittsburgh, Pa.*

The time of settling should be standardized, and the best flocculation should not be determined by guessing which is the clearest jar. A turbidity determination should be made. At best the results obtained may be only empirical but empirical results can easily be related to plant operation with excellent control possibilities.

Corrosion Problems

When H. M. Olson of the Ohio Salt Co. was put on the program he thought he had **"An Unusual Problem of Corrosion"** but by the time the meeting was held, he had found similar problems elsewhere. This particular problem occurs in a zeolite softened water, in which it was noted that where the valve stem and disc are in contact, the stem corrodes, apparently from galvanic action caused by the slight difference in composition of the two pieces of metal. It was observed that the pH of the water dropped as the zeolite runs down. The best remedy was found to be to coat the stem with tin.

SYMPOSIUM ON RAW WATER QUALITY AS AFFECTED BY POLLUTION

With D. E. Davis, Consulting Engr., The Chester Engineers, Pittsburgh, Pa., in the presiding chair, the afternoon session was devoted to a symposium of raw water quality and the effects of pollution thereon.

Pennsylvania Stream Pollution Policies

E. A. Holbrook, Dean, School of Engineering and Mines, University of Pittsburgh, and a member of the Pennsylvania Sanitary Water Board, told of the policies of that board toward stream pollution, after first reviewing the history of the board.

Early attempts to clean up the streams of Pennsylvania were hampered by laws or lack of them. In 1937 pollution was defined in its broader sense by an act of the legislature; then in 1939 planning began in earnest with the result that today there is a definite program for cleaning up the streams of the Keystone state.

Dean Holbrook said that among the

Penna. Health Dept. Programmers

C. H. Young, Dist. Engr., Meadville, Pa. — *J. R. Hoffert, Secy. State Water Board, Harrisburg, Pa.*

difficulties run into were the attitudes of some industrialists who pleaded poverty, and others who were sincerely convinced that they had no problem, but that the other fellow had a terrific one. Under the present Penna. Attorney-General much has been accomplished in obtaining industrial cooperation.

Industries have been grouped as: those which do not pollute streams, those which do pollute, those which exhibit poor housekeeping thus permitting pollution, and those which pollute with a waste which at the present has no known reasonable or practical treatment.

Penna. Pollution Control Program

In presenting the **"Pollution Control Program of the Pennsylvania Sanitary Water Board,"** J. R. Hoffert, Secy. of the Board, said that people generally now recognize the need for pollution abatement. The theory that no one has a right to dispose of waste without paying for its disposal is gaining in understanding and acceptance. The disposal of waste as a utility is now more easily recognized as comparable to the production and distribution of water supply.

In Pennsylvania, funds have been provided to pay for up to one-half of the cost of plans for treatment facilities, after the Board has approved the cost estimate of the municipality. For industry, funds will be provided on the same basis for plans for an experimental installation for the study of a waste that now has no known treatment.

Wastes in Pennsylvania are classified as follows:

1. Acid mine drainage, on which nothing is now to be done.
2. Wastes discharged into streams that are almost clean; these must be subjected to primary treatment at least.
3. Wastes discharged into clean streams; must receive complete treatment.

Only two years are to be allowed in which to carry out this program; the first step of which is the preparation of plans for treatment. No new pollution is to be allowed in the state. Wastes must remove practically all of the suspended solids and at least 35 per cent of the B.O.D.

Coal washing is one problem to be attacked; many other cases will work out such that the industry will merely build treatment plants of the conventional sewage treatment type. The problem of acid mine drainage is to be subject to research and there is at present a research program on that important problem, being conducted under the direction of W. W. Hodge, Director of the School of Engineering at West Virginia University, Morgantown, W. Va.

As to the extent of the mine drainage problem, Mr. Hoffert pointed out that the Allegheny River receives daily a load of 4,200 tons of sulfate and 11,000 tons of acid, while the Monongahela receives something over half of that amount.

Pollution in Western Pennsylvania

C. H. Young, and L. S. Morgan, District Engineers of the Penna. Dept. of Health, spoke on the **"Scope and Magnitude of Pollution in Western Pennsylvania."**

In the section of western Pennsylvania covered by Mr. Young the population density is quite high, running from 296 to 105 per sq. mi. A total of 2.4 million persons take their water supply from the streams of this region.

The construction of flood control reservoirs in this area has aggravated some problems while improving others. While these reservoirs make possible increased flow in dry weather and thereby improve the D. O. conditions in the polluted streams, there are at the same time problems presented for the water treatment plant. For example, if the water in the impounded reservoir receives untreated sewage, then when it is released in the dry months, the coliform content of water supplies below that dam are greatly increased.

The Mahoning River is grossly polluted, and other streams likewise need the sewage removed therefrom. Removal of phenol is needed in many places; in one stream the phenol content runs up to 1,600 parts per billion. At the present time there are a few sewage plants operating in this area, and a number more are under design. Most need complete treatment as do many industries. One whiskey industry has, for example, a population equivalent of 356,000 persons. There are many other industries which likewise need treatment, the cellulose acetate wastes of the Rayon industry, cyanide wastes, and oil wastes among others.

Programmers

J. B. Nickel, Tennessee Corp., Atlanta, Ga. — *H. M. Olson, Ohio Salt Co., Pittsburgh, Pa.*

Water Quality Experts

A. R. Todd, Supt. Filtration, Wheeling, W. Va. — *C. F. Drake, Supt. Filtration, Pittsburgh, Pa.*

On the brighter side of the picture, it was reported that the acid in one stream had now been reduced from 1,020 ppm. to minus 4 to 5 ppm. The Lower Ohio meanwhile practically depends on the acid and iron wastes to keep the bacterial content down. This dependency of one pollution to reduce another is not a healthy condition.

Mr. Young reported that industry was planning improvements and pollution abatement. Already the synthetic rubber waste problem had been reduced, and many municipalities are already planning treatment plants.

That industrial waste treatment is not all expense was cited by Mr. Young with particular reference to the plant which now recovers 4,000 gallons of ether a day at a saving of $1,000,000 a year.

In regard to the construction of impounding reservoirs for flood control, Mr. Young warned that serious consideration should first be given to the extent of pollution of the impounded water and the effect it would have when released, on the downstream municipal water supplies.

L. S. Morgan, speaking about the upper section of the Western Part of Pennsylvania, said that with 407 municipalities in the area, and a population of 2⅓ millions, a high population density of 1,900 to 77 (averaging 400) per sq. mi. This is an active bituminous

coal mining area, and in addition contains industrial wastes of all types, municipal sewage, and acid mine wastes high in sulfate.

Of the 407 municipalities, 180 have sewers discharging domestic waste from 1.8 million persons. There are 45 industries in 37 cities having a population equivalent of 860,000 persons.

The Monongahela River carries 52 per cent of the pollution load of 2,325,000 persons including the industrial wastes. Only 44 tons out of some 2,000 tons of acid may be attributed to industry in this area.

Raw Water Quality

C. F. Drake, Supt. of Filtration, Pittsburgh Water Dept., read a paper on the quality of water in the **Allegheny River at Aspinwall.** According to Mr. Drake, the dissolved oxygen in the Allegheny goes as low as 80 per cent of saturation, indicating a heavy pollution. The hardness of the stream has varied from 48 to 188 ppm. with an average of 105 ppm. Since 1909 the hardness has gradually increased, and the alkalinity decreased, the water sometimes being quite acid. The use of soda ash has increased over the years and the Pittsburgh Water plant now uses 2.3 million lb. a year.

Mr. Drake, like Mr. Young, believes that construction of impounded reservoirs must receive serious consideration with all factors being considered. For example, he believes that if reservoirs are constructed, the water will have to be limed or it will spoil water supplies below that point.

F. W. Bouson, Chief Chemist, So. Pittsburgh Water Co., in Pittsburgh, had a story to tell about the quality of the water in the **Monongahela River at Pittsburgh.** Acid mine drainage caused the solution of salts in the stream bed, thereby increasing the hardness. At Pittsburgh, the acidity averaged 38 ppm. in 1939. Industries use lime which fortunately reduces the acidity of the Pittsburgh Pool. The water company softens the water, which varies in quality with rainfall and runoff. The only good effects attributable to these acid wastes are the resulting low bacterial content and good coagulation.

B. French Johnson, Chemist, City of New Castle Water Co., had something to say about the **Shenango River at New Castle, Pa.** Before the advent of the Pymatuning Dam, there were wide fluctuations in the quality of the Shenango River. Manganese, industrial wastes, tastes and odors, hardness, and coliform concentrations running from 1000 to 100,000 per 100 ml. were but part of the problem. High concentrations of algae didn't help matters either.

Since the reservoir has been in operation, the peaks and wide fluctuations have been ironed out and industrial wastes have been reduced in quantity but the coagulation dosage still varies.

A. R. Todd, Supt. of Filtration, Wheeling, W. Va., Water Dept., raised a pointed question when he talked on

Pa. W. W. Operators Assn. President

R. B. Adams
Chemist
Penna. Water Co.
Wilkinsburg, Pa.
(Presided over session on Water Works Problems)

the **Ohio River at Wheeling, W. Va.** Mr. Todd titled his paper the "Magnitude of the Ever-Increasing Rate of Pollution of the Ohio River at the Wheeling Water Works" and asked "Has the Ohio River water become so polluted that it is no longer fit to be used as a source of public water supply?"

While hoping perhaps for some miracle that would change the ever-increasing waste load or otherwise reduce pollution, Wheeling has come face to face with the fact that every year since 1826, the Ohio River has been changing for the worse. Until 1918, the water was used as pumped, with no filtration and no disinfection; this in spite of the fact that typhoid had been increasing after 1900, and in 1913 there had been a big fish kill, so big that crowds gathered to see the fish float by.

Typhoid decreased after 1918 when chlorination was started, and disappeared after 1925 when the filtration plant was placed in operation. The increase in pollution in the Ohio River is shown by the increase in chlorine required to maintain a 0.1 ppm. residual.

Year	Chlorine Dose—lb. per mil. gal.
1918	1.4
1925	2.5
1933	4.0
1939	8.0
1944	14.0

A tenfold increase in 26 years! And meanwhile tastes, too, were a problem. The first of these came in 1928. Since then ammonia and pre-and post-chlorination have been helpful in combatting tastes with the help of carbon. As the taste and odor problem increased, more chemicals were used and in 1940 "breakpoint" chlorination was tried, and this worked until the war when industrial wastes above Wheeling increased again, with the final blow being the operation of the Butadiene plant at Karbuta, Pa. Super-chlorination followed by dechlorination was then resorted to, together with activated carbon, and split lime treatment to raise the pH of the water.

The result of all this treatment is a good tasting water from May to September, a passable water in February, March, April, and October and a not so good water in November, December, and January, with November being the worst month.

Experiments indicate that by using soda ash instead of lime a better tasting water can be produced above pH 7.5 but soda ash will add to the chemical costs and those have already gone from $2.53 per mil. gal in 1938-39 to $5.76 per mil. gal. in 1944-45. Filter runs, too, have decreased as chemical costs have soared.

But with the ever-increasing industrial waste load on the River it has begun to appear that further treatment is impossible unless that treatment consists of pretreatment on the order of a sewage treatment plant.

Without a pretreatment plant, Wheeling is facing the hard facts and is planning on well water to dilute the Ohio River water. Plans call for 10 per cent well water this year, and based on the increased rate of pollution for the past five years, Wheeling will need 20 per cent of ground water in 1947 and 30 per cent by 1949. The cost of an equipped well to supply 10 per cent of the normal pumpage is estimated at $10,000. Chemical costs should be reduced by one per cent for each per cent of ground water used up to 30 per cent ground water. Above that combination, softening would be required.

Mr. Todd closed the presentation of his paper with the same question with which he had opened it, "Has the Ohio River water become so polluted that it is no longer fit to be used as a source of public water supply?" (G.E.S.)

Dallas, Ore., Establishes Fund for Sewage Plant

Something new in financing sewage treatment plants has been inaugurated in Dallas, Oregon. A sinking fund to defray the cost of a sewage treatment plant and sewer system was begun on Oct. 1, when residential water users of Dallas began paying a monthly fee of 50 cents. W. H. Soehren, manager of the Dallas Water Commission, didn't say how long it would take to accumulate the fund, but construction of the plant will not be started until sufficient funds have been accumulated. The plant, contemplated by local leaders for a number of years, is a necessary part of the project to eliminate pollution from the Willamette River.

Our hats are off to any municipality that believes so firmly in the pay as you go idea. At the same time we hope that waiting for the fund to accumulate won't delay too long the elimination of that pollution in the Willamette River. Sewage plants can well be financed by revenue bonds which can be paid for by sewer service charges.

MICHIGAN SECTION AWWA AND MICH. CONF. HOLD JOINT MEETING IN GRAND RAPIDS

Program Features Fluorination and Super-Chlorination

By HARRY A. FABER*
Editorial Associate
WATER WORKS AND SEWERAGE

Chairmen

Mich. Water Conference
W. L. Harris
Chief Chemist
Grand Rapids

Mich. Section AWWA
R. Lee Sensabaugh
Supt. Filtration
Muskegon

A REGISTRATION of more than 150 members proved that the joint meeting of the Michigan Section of the AWWA and of the Michigan Conference on Water Purification fulfills a definite need. The sessions on September 19th and 20th in Grand Rapids constituted the Seventh Annual meeting of the AWWA section and the Twenty-Second Annual meeting of the Conference.

Earl Holloway, Supt. of Water Dept., Flint, and Rene J. La Marre, Supervisor of Filtration, Detroit, were joint Chairmen of the sessions. The Conference was opened by an official welcome from Walter Sack, City Manager of Grand Rapids, who pointed out that this city is the largest of three cities which have inaugurated extended tests of fluorine addition to the water supply for control of tooth decay. Grand Rapids has a population of some 170,000.

At the annual banquet, Paul Stegeman, Supt. of Water and Sewerage at Midland, acted as toastmaster and introduced Louis B. Harrison, Supt. of Filtration, Bay City, Chairman of the Fuller Memorial Award Committee. As recipient of the 1945 Award, the committee designated Raymond J. Faust, Chief, Division of Water Supply, Michigan Health Dept., for his leadership and contributions to advancement of water supply practices and standards in Michigan.

Speakers at the banquet included Dr. William De Kleine, Commissioner of the Michigan Dept. Health, who summarized the tremendous gains in public health of the State and recognized the large contribution made by those responsible for the purification of water supplies. Dr. DeKleine announced the establishment of the Edward Dunbar Rich Service Award for water works men who have attained twenty-five years of service in their field. This award is a development of a similar idea originated by the Indiana State Health Department and furthered by Mr. Faust. Suitable certificates signed by the Governor and the Health Commissioner of Michigan will be awarded recipients each year at the annual banquet. The award honors the name of Colonel E. D. Rich who so ably directed the Engineering Division of the Michigan Health Department from 1913 until 1940.

*Research chemist, The Chlorine Institute, Inc., New York, N. Y.

Two Job Man!
Raymond J. Faust
Chief, Div. of Water, Mich. Health Dept. Lansing
(New Secy.-Treas. of Mich. Section and long-time Secy. Mich. Conf. on Water Purification)

Vice-Pres. LaDue on Post-war Outlook

Wendell R. LaDue, Chief Engineer, Water and Sewer Dept., Akron, Ohio, and Vice-President of the AWWA called attention to the fact that the war has ended before all blueprint plans for postwar construction are prepared. Immediate problems are those of deferred maintenance and of public relations. The latter requires that each community be made to recognize the personal connections of the local water works. The AWWA now has a committee at work to develop the leadership and direction for this accomplishment.

Harry E. Jordan, Secretary of the AWWA, complimented the Michigan section for recognizing the value of individual service in establishing the Rich Award, and cited several examples to illustrate that the importance or value of an employee's contribution does not necessarily mean that he must be in a high rated position.

An inspection of the Grand Rapids Filtration Plant was provided to give everyone first-hand information on the application of fluorine (fluoride) and on the water testing methods employed. W. L. Harris, Chief Chemist of the Water Dept., arranged conducted tours through the plant, where special interest was shown in the fully enclosed Omega dry feeder employed to feed the sodium fluoride. Details of this treatment are reported upon further on in this account.

The joint meeting in 1946 is to be held at Traverse City.

New Officers

The Michigan Section, AWWA, elected the following officers for the year:

Chairman:
R. Lee Sensabaugh, Supt. of Filtration, Muskegon.

Vice-Chairman:
Owen A. McCarthy, Supt. Water Dept., Dearborn.

Secretary-Treasurer:
Raymond J. Faust, Chief, Div. of Water Supply, State Health Dept., Lansing.

Trustee:
Paul Stegeman, Supt. Water and Sewer Dept., Midland.

The Michigan Conference on Water Purification elected the following officers for the year:

Chairman:
W. L. Harris, Chief Chemist, Water Dept., Grand Rapids.

Vice-Chairman:
John Dye, Chief Operator, Water Conditioning Plant, Lansing.

Presider
R. J. La Marre
Supvr. Filtration
Detroit
(Past Chairman)

Toastmaster
Paul Stegeman
Supt. of Water
Midland
(Section Trustee)

(An article intended for our strike-bound October issue.)

Nomographs
John Dye
Chief Operator
Water Plant
Lansing

Cross Connections
Andrew Dempster
San. Engr.
Dept. Health
Detroit

Round Table
Harry McEn'ee
Chief Chemist
Water Plant
Ann Arbor

Synthetic Resins
Dr. W. C. Bauman
Engineer
Dow Chem. Co.
Midland

Programmers

Pumping
Lewis Ayres
Cons. Engr.
Ann Arbor

Round Table
Douglas Feben
Chief Chemist
Water Dept.
Detroit

Secretary-Treasurer:
Raymond J. Faust, State Dept. of Health, Lansing.

Member, Executive Committee:
J. E. Cooper, Supt. Water Purification, Ford Motor Co., Dearborn.

SUPER CHLORINATION
(A Round Table Discussion)

T. L. Vander Velde, Engineer, State Health Dept., introduced a round table discussion on the application and experiences with super-chlorination treatment in Michigan by discussing three important aspects of this form of treatment. He listed the advantages of super-chlorination as improvements which result in bacterial quality, color removal, coagulation results, and in the maintenance of residual chlorine farther into the distribution system. He reviewed control tests, the ortho-tolidine flash test, the OTA (ortho-tolidine-arsenite) test, and jar tests, and their importance in proper dosage maintenance. The problems encountered in the application of super-chlorination were described by him as: The increase in tastes or in chlorinous odors which may result from too low or too high a chlorine dose; the difficulty of applying this treatment in those systems where the chlorinated water is pumped directly to the distribution system; the removal of chlorinous tastes from filter effluents by using activated carbon or chemical dechlorination.

At Marquette, super-chlorination beyond the break-point has proven superior to chlorine-ammonia treatment for control of phenol tastes, has reduced color by at least 25 per cent, and destroys all forms of resistant gas-forming bacteria.

Henry Gork, City Manager, East Grand Rapids, described the application of super-chlorination as the only treatment applied to water pumped directly from a lake source to the distribution system. Previously, with chlorine-ammonia treatment, gas-forming bacteria, which confirmed, were found in the treated water. Now almost complete elimination of gas-formers is accomplished, the taste is markedly improved, and a residual of 1.0 to 2.0 ppm. through the distribution system is provided by a chlorine dose of about 5.0 ppm.

R. Lee Sensabaugh, Supt. of Filtration, Muskegon, pointed out that an unusually long contact period of 12 to 16 hours is available at his plant. Maintenance of about 1.5 ppm. residual chlorine in the plant effluent results in a residual of 0.5 ppm. at a service reservoir and of at least 0.1 ppm. residual to the very end of a 12 mile distribution system. The treatment controls odors and does so at a reasonable cost.

Louis B. Harrison, Supt. of Filtration, Bay City, emphasized the necessity of maintaining free chlorine residuals. At this plant super-chlorination beyond the break-point reduces a threshold odor of 50 down to 10, further treatment with powdered activated carbon reduces it to 4, and subsequent treatment through granular activated carbon filters results in reduction down to a threshold odor of 1.0.

J. E. Cooper, Ford Motor Co., Dearborn, discussed the chemistry involved in super-chlorination of water and described the application of this process to the destruction of slime growths in condenser cooling water. At the Flat Rock and Willow Run plants, flows as great as 416,000 gpm. have been treated and intermittent chlorination above the break-point for at least ten minute periods effectively destroys resistant slime organisms. After such treatment, no gas producing spore formers are found. Chlorine residuals of 1.0 to 3.0 ppm. can be maintained without taste.

Henry La Fountaine, Supt., Marquette, noted that only about 10 min. contact is provided in that plant but that phenolic tastes are considerably reduced by a chlorine dose of only 1.5 ppm. At St. Ignace, **Frank Gladshaw,** Supt., stated that a similar dose has resulted in much improved disinfection results and the elimination of tastes.

At the Grand Rapids plant, **W. L. Harris** has found super-chlorination with seven to eight hours contact, followed by dechlorination to reduce the excess chlorine to 0.3 ppm. residual, will produce bacteriologically satisfactory water and eliminates algae in the sedimentation basin.

L. B. Harrison here observed that chlorine taste in water may be more noticeable after an individual has eaten acidic fruits such as lemons, oranges, grapefruit or apples.

News from the Field

In his regularly featured review of happenings in the water works world, **Raymond J. Faust,** Chief, Division of Water Supply, Michigan Dept. of Health, Lansing, pointed out that the past year has been more eventful than any similar previous period. With the conclusion of the war there is every reason to congratulate those responsible for the maintenance of water supplies. Despite great difficulties, health has not suffered and no epidemics of water borne typhoid fever or dysentery have occurred in the State. The manpower shortage will be alleviated, repairs and building can be undertaken, and "victory" models will disappear.

Mr. Faust called attention to the strike which started at the Pennsylvania Salt Mfg. Company's plant in Wyandotte on September 7th. This affects the chlorine supply at about 65 per cent of the Michigan water supplies, and the State Health Dept. is taking action to prevent a hazardous situation developing. (Since the time of this meeting, it is reported that union officials have permitted removal from the plant of chlorine cylinders and ton containers loaded prior to the strike, these to be held under the jurisdiction of the State Dept. of Health.) (Ed. Note: The strike was later settled, fortunately before any water plant ran out of chlorine, although Chicago was forced to load its ton-containers from single unit tank cars delivered to the new Southside Filter Plant.)

Mr. Faust commented on the improvements in water quality at some ten plants in the State which employ super-chlorination. It is well established that at least one hour of contact time should be available, that the process gives better results when employed with filtration, that phenols can be successfully oxidized, and that a residual of free available chlorine must be present in the finished water. Chlorine dioxide treatment is now in plant scale use at Wyandotte and at Monroe, but with high prechlorination doses being employed at both plants.

Geology, Ion Exchange, and Cross Connections

"Geology in Relation to Water Supplies"—by Norman Billings, State Dept.

of Conservation, and John Ferris, U. S. G. S., Lansing.

The authors pointed out that the majority of Michigan's underground water supplies were formed under shallow inland seas and eventually the entire area was lifted above sea level as it exists today. The salt brines are from trapped sea water and some contamination of fresh water from brine has taken place. Certain underground supplies have become reduced and almost exhausted because of concentrated over-development. A better distribution of wells over given areas may be essential.

"Synthetic Resins"—by Dr. W. C. Bauman, Dow Chemical Co., Midland.

The great improvement in ion exchange capacity of new synthetic resins over the natural greensands during the past five years was shown by Dr. Bauman to be at least ten-fold. The operating capacity of various forms can readily be determined in the laboratory, but their actual efficiency depends on a wide variety of factors. Dissolved air, carbon dioxide, and silicon dioxide are not removed from water by anion exchange treatment, but deaeration can remove the first two and the use of fluorides (to form a fluosilicate) for removal of the last is giving promise. With success in this direction, the water chemist's dream of an ion exchange method of producing water comparable to distilled water, at a cost much lower than distillation, will have been realized. Production of such water by the use of resins will usually cost twenty to thirty cents (chemical cost) per 1,000 gallons. The new resins may be employed at a filtration rate of 5 to 7 gal. per sq. ft. per min., and application of influent water below the surface of the filter is reported to have materially increased the length of runs.

"Back Siphonage and Cross Connections"—by Andrew Dempster, Sanitary Engineer, Detroit Dept. of Health.

Mr. Dempster employed a parable as a most unusual and striking means of telling the story of potable water supply contamination through cross-connections and by back siphonage through plumbing facilities. He described the use of water from the Coliform River for a model town which President "Ty" Phosa built for housing employees at the Colibank defense plant. Despite every good intention in providing modern facilities, corrosion, gross contamination, the collapse of hot water heaters, and dysentery epidemics were but a few of the difficulties experienced. Mr. Dempster described how the installation of proper plumbing fixtures, together with conventional filtration and chlorination corrected the situation.

Water Superintendents All

J. F. Rubbo, Iron Mountain — *C. C. Vance, Mackinac Island* — *Sid De Boer, Grosse Point Farms* — *John Musser, Flint*

Pumping, Nomographs, and Bacteriology

"Some Problems Connected with Electrical Plumbing"—by Lewis Ayres, Consulting Engineer, Ann Arbor.

Devoting his discussion mainly to centrifugal pumps, Mr. Ayres showed that electric motor driven pumps require only a fraction of the space and first cost as that for steam turbines. The electric centrifugals, however, require continuity of electric power supply and do not have head capacity characteristics well adapted to water works demands. A power supply in the same building, duplicate power lines, or standby units are important and elevated storage is almost essential. Variable and fixed speed pumping units are desirable for large stations and plug or cone valves are most desirable as check valves and for throttling flows. Mr. Ayres clearly showed the need for careful study, planning, and operation of the motor driven pumping unit.

"pH—Alkalinity Nomographs"—by John Dye, Chief Operator, Water Conditioning Plant, Lansing.

In presenting a number of improved and extended nomographic diagrams, Mr. Dye pointed out that the determination of values at 25° C. is poor technique and that such results will be seriously in error. His new diagrams will provide corrections for temperature ranges of 0 to 60° C. and for dissolved solids ranging from 0 to 800 ppm. By means of lantern slides, the author showed nomographs for hydroxide, carbonate, and bicarbonate ions, and for free carbon dioxide. It is to be hoped that these useful charts will be published for application in water softening plant operation.

"Water May Be Dangerous"—by F. S. Leeder, M.D., Director, Bureau of Epidemiology, Michigan Dept. of Health.

According to Dr. Leeder, entire wards of hospitals were formerly required for typhoid fever patients: over 5,000 cases per year occurred in Michigan prior to 1900, but now there are never more than 35 cases. It is now over ten years since a single case has been traced to an approved Michigan water supply but the potential danger still exists. It is known that virus diseases require higher doses of chlorine or longer contact time for destruction than do pathogenic bacteria, and that both may be water borne. He pointed out that chemical contamination can make water dangerous or at least offensive. The courts have held it a moral and legal responsibility of water works officials to provide a safe water.

Chlorine Dioxide, Inservice Training, and Fluorination

"Application of Chlorine Dioxide to Municipal Water Supplies"—by Harry Ward, Chief Chemist, Filtration Plant, Wyandotte.

Mr. Ward outlined the development of chlorine dioxide treatment and discussed its present application in the Wyandotte plant. Prechlorination is used in combination with chlorine dioxide (a 0.5 ppm. dose is usually sufficient) and some additional chlorine is applied in post treatment. This treatment seems to be quite specific for chlorophenol taste correction and is giving good results at reasonable cost.

Round Table Discussion of Inservice Training Schools

(Douglas Feben, Detroit; Harry McEntee, Ann Arbor; and W. L. Harris, Grand Rapids, participating.)

As time was becoming short, only a brief review was given of the specialized topics presented at the successful first Inservice Training School last spring at the University of Michigan. Mr. Feben commented on the very comprehensive paper by Professor Starkey on the subject of iron bacteria. (This paper, published in full in the October journal of the AWWA, warrants careful study by the water works profession.—Ed.)

Mr. McEntee commented on the chemistry of iron in water and reviewed the papers on this subject presented by Dr. Buswell and Mr. Wieters.

Mr. Harris outlined the relation of fluorine in water to dental decay. He pointed out that Grand Rapids, which began the treatment of its water supply with fluorine on January 25, 1945, was the first city in North America to do so. The U. S. Public Health Service has already completed a dental examination of approximately 32,000 children, ranging in age from two years through junior college, to establish a base line for its study of the results. It has also examined some 8,000 children of the same age group in Muskegon, where the water supply is not treated with fluorine, which will be used as a control city for comparison of results. It is recognized that a careful study extending over a 5 to 10 year period is essential for providing conclusions as to the value of this treatment. Sodium fluoride is used to supply a maximum dose of 1.0 ppm. fluorine at a cost of $1.43 per mil. gal. or a per capita cost of six and one-half cents per year. The Common Council of Grand Rapids has authorized a 10 year test to extend until 1955.

N.E. SEWAGE WORKS ASSN. FALL MEETING

Presidents

Incoming
George Craemer
Supt.
Hartford, Conn.

Retiring
Frank L. Flood
Cons. Engr.
Boston, Mass.

CONVENING in Springfield, Mass., for one day on Sept. 12, the New England Sewage Works Assn. held its 16th annual meeting, with 115 registrants attending. By unanimous vote the meeting elected the list of officers submitted by the Association's nominating committee. The officers for the ensuing year are:

President:

George H. Craemer, Supt., Sewage Treatment Works, Hartford, Conn.

1st Vice-President:

Thomas R. Camp, Cons. Engr., Boston, Mass.

2nd Vice-President:

LeRoy W. VanKleeck, San. Engr., Dept. of Health, Hartford, Conn.

Directors:

Howard F. Carpenter, Supt. of Sewage Treatment, Providence R. I.

Ralph W. Horne, Cons. Engr., Boston, Mass.

R. S. Burr, Engr., American Brass Co., Waterbury, Conn.

Secretary-Treasurer:

Walter E. Merrill, State Dept. of Health, Boston, Mass.

On the announcement of the retirement of LeRoy VanKleeck as Secy.-Treas., after eight years' service, the meeting gave vocal expression of thanks for a job well done.

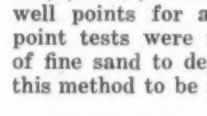
At the lunch, John Szymanski, Supt. of the Sewage Plant at New Britain, Conn., was awarded first prize for the best annual report in 1944.

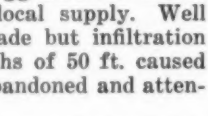
Use of Sewage Plant Effluent

Robert Burrell, Supt. of Sewage Treatment at West Haven, Conn., presented the first paper on the program on the subject of "The Use of Effluent Water at Sewage Plants." Mr. Burrell said, "The proper use of water in any sewage plant is an important factor in the economy of plant operation. If plant effluent can be used as a substitute for public potable water . . . a yearly saving can be realized that will pay off the cost of the original investment in two or three years."

The Village of West Haven treatment plant consists of three plain sedimentation tanks, followed by chlorination of the settled effluent. Raw sludge removed by sedimentation is filtered on vacuum filters.

In 1940 one of the local board members questioned the high annual water bill for the sewage plant (it amounted to $1,300.00) and suggested the use of well points for a local supply. Well point tests were made but infiltration of fine sand to depths of 50 ft. caused this method to be abandoned and attention was then turned to the use of effluent water.





Vice Presidents

First
Tom R. Camp
Cons. Engr.
Boston, Mass.

Second
Le Roy Van Kleeck
San. Engr.
Conn. Dep. of Health

Mr. Burrell discussed the project under five headings, construction, maintenance, uses and advantages, disadvantages, and cost and savings. The principal parts of the system included a Fairbanks-Morse pump and motor, a pressure tank, a Nu-Matic tank and pressure regulator. The pump was capable of discharging 100 gpm. at 60 lb. pressure, and the pressure was regulated by the pneumatic system.

It was suggested that an air-compressor standby unit be installed for emergency, but to save that cost, an emergency broken connection to the public supply was installed, and has been used several times in five years.

It is necessary to strain the chlorinated effluent water before it enters the pumping system. A standard piece of 4-in. pipe, 4-ft. long was drilled with six rows of ½-in. diameter holes spaced on 4-in. centers. The strainer was capped on one end and valved on the other. Another strainer of fine mesh wire was built to enclose the 4-in. pipe. The protection of this strainer system allowed nothing but the finest silt or grease to pass to the pumping system, except occasionally when tomato seeds got through the strainer. The strainer was located in the effluent channel on the downstream side from the settling tanks and a six inch baffle installed to assure submergence.

In addition to this strainer, another strainer on the discharge side of the pumping and pressure system protects the chlorinators.

Maintenance includes cleaning of the strainers, at regular weekly intervals, cleaning the pump monthly, checking the pump bearings daily, cleaning the entire pumping and pressure system every three months, and painting all exposed piping once each year.

While the public water system is used for tray water in the chlorinators, the solution water for the chlorinators is effluent water. The effluent water is also used to wash down the three settling tanks daily, and for breaking up storaged sludge collected in a converted Imhoff tank. This tank, which collects about nine months' sludge storage before pumping to auxiliary sludge beds, develops a heavy scum layer which must be broken up before the sludge can be pumped to the beds. Effluent water is used to soften and break up this scum. The amount of public supply water saved by the use of effluent water amounts to approximately four million gallons a year.

The disadvantages of the system nearly all originate in trouble with the pumping and pressure system, particularly in the pneumatic pressure control system, which suffers from hydrogen sulfide and accumulations of solids. The pump troubles can usually be traced to tomato seeds which swell up and will not pass through the impeller, and thereby cut down the pump capacity.

The total cost of the system was $1,400 and since 1940 the annual water bill

Director
R. S. Burr
Am. Brass Co.
Waterbury, Conn.

Award Winner
John R. Szymanski
Supt. Treat. Plant
New Britain, Conn.

(An article intended for our strike-bound October issue.)

for public supply has been about $750 compared to the previous bills of $1,300 a year. It is estimated that after deducting the cost of operation, the annual saving is approximately $500, an amount which amortized the original investment in less than three years.

In the discussion which followed this paper it was brought out that there is a definite tendency to use effluent water for flushing purposes. New Britain, Conn., which has complete treatment, is an example of a sewage plant that uses the final effluent for almost every purpose around the sewage plant.

Sludge as Fertilizer

LeRoy VanKleeck, San. Engr. of the Connecticut Dept. of Health, has written a paper or two, himself, on fertilizer values of sewage sludge and it was only natural that he would interest the Conn. Agr. Exp. Sta. in sludge as a fertilizer.

Consequently, **Dr. H. A. Lunt**, Acting Head of the Dept. of Soils of the Agr. Exp. Sta., carried on some "Preliminary Greenhouse Studies of Digested Sludge as a Fertilizer" and reported on his findings in a paper by that name. One of the observations noted was that lime-ferric chloride treated sludge has a high pH which decreases on standing because of the presence and subsequent loss of ammonia to the atmosphere. Such sludges when added to soils, tend to increase the pH of the soil slightly but this increase is generally lost in a period of three months. Soil tests showed that the higher rates (up to 40 tons per acre) were reflected in an increase in available calcium and a decrease in available aluminum.

These above results were made on uncropped soils. When sludge of pH 7.2-7.5 was applied to a cropped soil, it was found that the pH of the soil increased with the increase in rate of application. Dr. Lunt concluded that frequent use of sludge is effective in correcting soil acidity. When lime is applied to a soil, the use of sludge appears to have a buffering effect on soil reaction.

As to the effects of sludge (lime and ferric chloride treated) on the production of crops, Dr. Lunt's experiments were inconclusive. In the first experiment the soils were all treated with a 3-8-7 fertilizer (1,200 lb. per acre) and then varying amounts of the sludge added.

Yields of the first crop, which was planted immediately after applying the sludge, tended to decrease with increase in sludge application (in the case of beans the difference was not significant). The second crop showed marked increases with treatment although the bean results again were not significant. Increases in crop production were noted for celery, beets, and beans but only the celery increases were really significant.

In the second set of experiments, where unlimed sludge was used, celery showed marked increases in amounts with increases in sludge additions, while beet and carrot production decreased with sludge additions.

Outdoor experiments revealed that sludge-treated potato vines remained green longer than did the others, but the results on potatoes produced were inconclusive indicating a need for nitrogen as well as sludge before any marked increase in potato production was observable.

Dr. Lunt concluded that for the relatively poor New England soils, one can hardly depend on sludge as the sole source of nitrogen or phosphorus. Sludge is principally a soil conditioner, improving the physical condition of the soil and increasing its water and nutrient-holding capacity, the sandier the texture and the lower the fertility the more this is true. On the basis of the results reported by Dr. Lunt it appeared that immediate increases in crop yields from the use of sludge can hardly be expected under all conditions and with all crops.

In the discussion of this paper, many in the audience believed that the conclusions were hardly fair to sludge inasmuch as the effect of sludge alone was not determined. It would have been better, thought many persons, if the studies had been made without treating the soil with a commercial fertilizer first. Several others cited excellent results obtained in improving lawns with sludge, and still others believed that studies should be made comparing unconditioned digested sludge with chemically treated sludge.

The meeting went on record as desiring further research studies on all phases of the subject of sludge fertility values.

Two Peddlers and a Prof.

K. Howland
Gen. Chem. Co.
Providence, R. I.
Prof. Clair N. Sawyer
Mass. Inst. Tech.
Cambridge, Mass.
R. W. (Dick) Ockershausen
Gen. Chem. Co.
New York City

Digestion Tank Emptying

Henry W. Bauer, Supt. of Sewage Treatment at Middletown, Conn., opened the symposium on the "Emptying of Digestion Tanks" by telling how they had closed all valves to the tank, opened it, and removed the supernatant liquor. After two days of natural ventilation the tank was entered, washed down, brushed, cleaned thoroughly and painted. In one instance, when sludge was pumped into the tank to start the filling a small explosion occurred. Thereafter empty tanks were filled with sewage first before any sludge was pumped in.

Programmers

Dr. H. A. Lunt
Agr. Expt. Sta.
New Haven, Conn.

W. A. McMahon
Supt.
Torrington, Conn.

W. A. McMahon of Torrington, Conn., told of installing a manhole in the center of the top of the tank cover in order to remove scum caused by the presence of wool fibres in the sewage. In order to make the change in the tank cover it was necessary to empty the tank first. The existing manholes were opened and the scum was hosed, then as the tank was emptied the sidewalls were hosed down. Inspection showed that the tank walls which had had three coats of Inertol four years previously, were still in good condition. The Torrington plant has no grit chamber, and as might be expected, two tons of grit were removed from the tank when empty.

With these two papers as openers, the discussion went rapidly into general comments by the audience on scum problems in sludge digestion tanks. **Joseph Doman** of Greenwich, Conn., told how recirculation had solved his scum problem in a tank with floating cover. **Henry W. Taylor**, Cons. Engr. of New York City, told of installing a jet of fresh water. And one plant treating industrial wastes told how the introduction of chromium wastes into the sewage had apparently caused the scum to disappear without any loss of gas production.

Safety Equipment

Following lunch, **Merrill L. Ingraham**, Safety Instructor, U. S. Dept. of Interior, Bur. of Mines, Washington, D. C., gave a demonstration on the use of safety equipment in the maintenance of sewers and sewage treatment plants. This practical demonstration consumed the entire afternoon. All of the equipment listed in the Federation Manual of Practice No. 1 (Occupational Hazards in the Operation of Sewage Works) was shown and fully demonstrated. (G. E. S.)

MANUFACTURERS ELECT SHERWOOD PRESIDENT

"Al" Paxton Becomes Vice-Pres.; Dresser, Gen'l Electric, and *Eng. News Record*, New Board Members

IN NEW YORK CITY on Oct. 24th, the Water and Sewage Works Mfgrs. Assn. held its annual meeting, which is ordinarily held during the convention of the Am. Water Wks. Assn., which this year was not held for the first time in the history of AWWA.

Wm. C. Sherwood

The Manufacturers' Association's principal bit of business was that of electing three new member firms to serve on the Board of Governors. Since the new constitution, as approved by the membership at large, discontinues the executive committees of the Water Division and the Sewage Division, these two committees were dropped. Likewise the new constitution does not provide for a membership under the Water Division or the Sewage Division alone as formerly. Therefore, all Class W and Class S member firms automatically became Class A member firms. Class "A" formerly designated firms which are interested in both water and sewage. There were too few members interested alone in water or in sewage to justify continuing the two classifications "W" and "S" memberships. All member firms are now on an equal footing and pay like dues, except the affiliate classification, Class "B" members, who are restricted in regard to exhibits beyond those at sectional meetings, and who do not sell materials or equipment beyond a restricted zone.

The firms elected to the Board of Governors were Dresser Mfg. Co., *Engineering News Record*, and General Electric Co. Re-elected to the Board for a second term of 3 years were Johns-Manville Corp. and Simplex Valve & Meter Co. The complete Board now embraces the following firms:

The Barrett Div.
The Dorr Co.
Dresser Mfg. Co.
Eng. News Record.
Gen'l. Electric Co.
Hersey Mfg. Co.
Hydraulic Devel. Co.
Johns-Manville Corp.
Link Belt Co.
Lock Joint Pipe Co.
Nat'l. Water Main Cl. Co.
The Permutit Co.
Pittsbg. Meter Co.
Simplex Valve & Meter Co.
Wallace & Tiernan Co.

This new Board then met and elected as officers the following:

President—Wm. C. Sherwood, Secy. Hersey Mfg. Co., Boston.

Vice-Pres.—"Al" E. Paxton, Publisher *Eng. News Record*, New York.

Determination of the pH of Water

Some Notes Regarding the Relationship Between Indicator and Sample

BY F. R. McCRUMB
W. A. Taylor & Co.
Baltimore, Md.

As has been repeatedly pointed out in the literature, the pH of the indicator solution plays an important part in determining the pH of slightly buffered materials by the commonly used colorimetric methods (1, 2, 3, 4, 5, 6, 7, 8). Although improper adjustment of the pH of indicator solutions is a potential source of error, this factor is frequently ignored. In fact, no emphasis is placed on it even in Standard Methods of Water Analysis as late as the 1936 edition.

Indicators are either weak acids or weak bases, and in preparing solutions of them they are usually partially neutralized. Indicator solutions thus contain mixtures of weak acids or bases and their salts and are therefore buffered. Their buffer action is, however, relatively weak due to the fact that the concentration is low. Therefore in determining the pH of highly buffered solutions by the ordinary comparator method, reasonable differences between the pH of the sample and the indicator solution will not affect the results. This is due to the fact that the stronger buffer action of the sample will overcome the relatively weak buffer action of the indicator.

In determining the pH of highly buffered materials no special precautions are necessary since the pH is not easily changed. With slightly buffered or unbuffered materials such as soil extracts, distilled water, steam condensate, many natural and treated waters, pure sugar liquors, solutions of neutral salts, etc., great care must be taken since such materials are very susceptible to change.

In addition to the possibility of loss or gain of carbon dioxide or other volatile substances, the indicator solution may change the pH of the sample unless the pH of the indicator solution is adjusted so that it is close to the pH of the sample or unless the ratio of indicator solution to sample is small.

Acree and Fawcett[5] employ the first procedure, which they call the isohydric indicator method. Indicator solutions are used which have been adjusted at 0.2 pH intervals over the useful range. For example, bromthymol blue indicator solutions should be available having pH values of 6.0, 6.2, 6.4, 6.6, 6.8, 7.0, 7.2, 7.4, and 7.6. The correct pH is shown by agreement between the pH as read by comparator and that of the indicator solution used. For less accurate work one can use three solutions adjusted to bottom, middle, and top of the range. While this procedure is capable of yielding very accurate results and is of value in research, it is much too cumbersome for control work.

The alternative method, which is just as accurate and much more practical, is one in which the volume of the indicator solution used is so small as compared to the volume of the sample that the pH of the indicator solution has little or no effect on the reading. By observing a deep layer of the sample-indicator mixture one can secure colors sufficiently heavy for comparison.

An operator can make pH color standards from buffer mixtures and indicator solutions in Nessler tubes, but it is simpler to use a commercial outfit for such testing. Whereas in most regular type pH comparators the ratio of indicator solution to sample is 1 to 10 or 1 to 20; in one commercial outfit designed specifically for water analysis the ratio is 1 to 150. Sufficient color for comparison is secured by observing a layer with a depth of 150 mm. In such a case the influence of the pH of the indicator solution is negligible.

References

1. Karracker, Soil Science, *15*, 473, (1923)
2. Marsh, Science, *59*, 216, (1924)
3. Schlegel and Steuber, Ind. Eng. Chem., *19*, 631 (1927)
4. Pierre and Fudge, J. Am. Chem. Soc., *50*, 1254, (1928)
5. Acree and Fawcett, J. Bact., *17*, 163 (1929); Ind. Eng. Chem. Anal. Ed. *2*, 78, (1930)
6. McCrumb and Kenny, J. Soc. Chem. Ind., *49*, 425T, 427T, (1930)
7. McCrumb, Ind. Eng. Chem. Anal. Ed., *3*, 233, (1931)
8. McCrumb, *Water Works and Sewerage*, *86*, 403, (1939)

SOME PROBLEMS AND CONSIDERATIONS IN OPEN CHANNEL FLOW MEASUREMENT

By R. E. SPRENKLE
Hydraulic Engineer
BAILEY METER CO.
CLEVELAND, O.

THE art of measuring the flow of water in open streams or channels is not new. As early as 1732 Henri Pitot obtained a measurement of water flow by inserting a piece of bent glass tubing into the Seine River and noting the height to which the water rose in the tube above the river surface. Through the intervening years many refinements have been made to this simple instrument, named the Pitot Tube after its inventor, but its present-day use is restricted mostly to exploratory and test applications with clean fluids, and with but few applications to commercial measurements.

The Author

Rectangular Weirs

The first practical measuring device for open channel flows was the rectangular weir, popularized by the extensive tests made by J. B. Francis in 1851 at Lowell, Mass. Rectangular weirs may be used either with or without end contractions. That is, the weir opening may completely span the channel, in which event the weir has no end contraction, or it may only partly span the channel or weir chamber as shown in Fig. 1. In this event it is known as a weir with end contractions, and it will be noted that both the ends and the bottom or sill of the weir are sharp edges to facilitate the flow of water over and around them.

Fig. 3 gives the discharge in mgd. through rectangular weirs of various lengths. Note that a choice can be had of several sizes of weirs for the same flow and that as the size weir increases, the head decreases.

Because of the simplicity and reliability of this type of weir it is still used quite extensively in the measurement of relatively clean water and other liquids.

V-Notch Weirs

The V-notch weir, because of its shape, is the most accurate for flows which vary widely in rate. This is due to the fact that the head of low flows is much higher than the head over an equivalent capacity rectangular weir, and therefore can be measured more accurately. The V-notch weir is limited, however, in capacity, as will be noted from the 90° V-notch curve included in Fig. 2.

Other Types of Weirs

In addition to the rectangular notch weir, other types of weirs are in current use, these being the trapezoidal, Cipoletti, hyperbolic, parabolic, and cycloidal. The trapezoidal and Cippoletti are forms of rectangular weirs but with their sides inclined outward from the vertical at a 1 to 4 slope, while the hyperbolic, parabolic and cycloidal are special weirs with curved sides to simplify the flow-head relationship. Actually the latter three special weirs are seldom used as flow measuring units.

Depending upon the size of the weirs, capacities of trapezoidal and Cipoletti weirs at heads of 15 inches and under average from 3 to 15 per cent greater than rectangular weirs, with the larger sizes having more nearly the same capacity.

Advantages and Disadvantages of Weirs

The chief advantages of any type of weir are (1) its relatively high accuracy, and (2) its low cost of construction and ease of installation. The equations for computing the flow are well established by experimental data so that these primary elements can be designed with complete assurance that good accuracy will be obtained.

All weirs, however, are subject to errors of measurement when sand, gravel, sediment, debris, and other solids are carried along with the

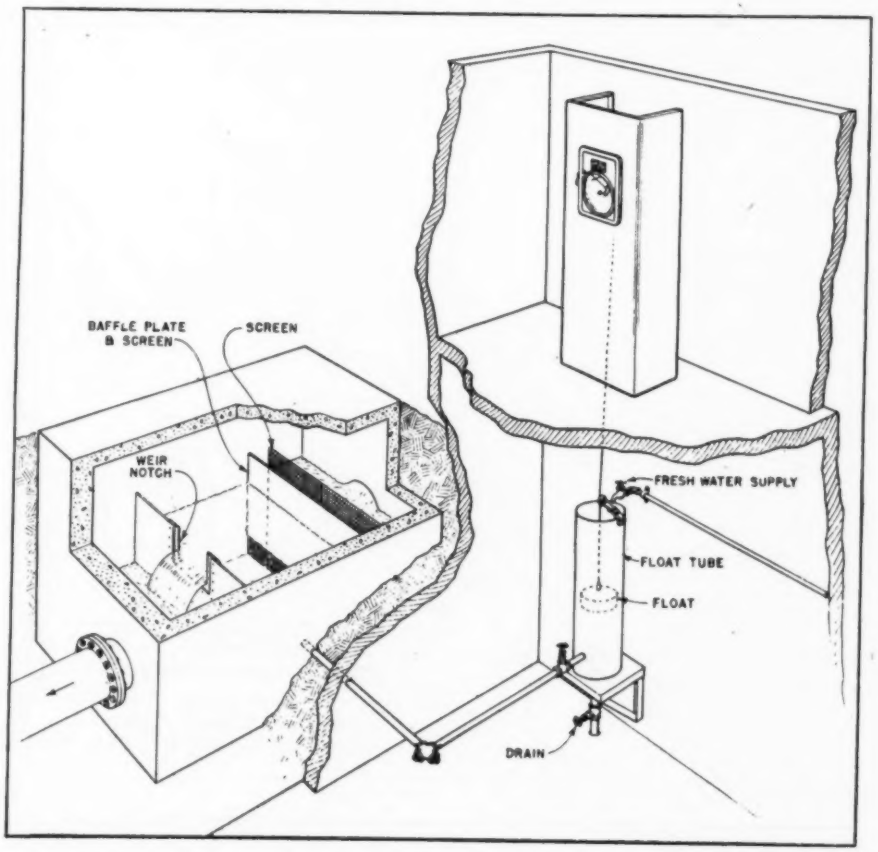


Fig. 1—Typical Installation of Float-Operated Meter with Rectangular Weir.

water. Such materials not only dam up against the weir bulkhead, thus increasing the velocity of approach, but also tend to cover the sill and sides of the weir, thus changing its area of opening.

Venturi Flumes

To obviate the above disadvantage, tests were started by the Colorado Experiment Station in 1915 and continued later at Cornell University on a water measuring device resembling an open top Venturi Tube, but with parallel sides and a flat bottom. This device, now known as the Venturi Flume, possesses a marked advantage over the weir, for the flow sweeping over the flat bottom tends to keep it clean. Besides, its head loss for any given flow rate is much less than that of weirs of the same capacity.

Parshall Flumes

An important modification of the Venturi Flume came into prominence a few years later as the result of investigations by Ralph L. Parshall, then Senior Irrigation Engineer with the United States Bureau of Agriculture. This device, now known as the Parshall Measuring Flume, is shown diagrammatically in Fig. 2. It is described in detail in Bulletin 423 published in 1936 by Colorado State College. In this flume the angles of convergence and divergence, and the dip in the bottom are such as to better stabilize the current flowing through it, thus resulting in an accuracy of from 2 to 5 per cent. Further, its general proportions are such as to make it entirely self-cleaning, and thus it maintains its accuracy. Although it has been available but a relatively short time, it has already proven to be a very reliable device for the measurement not only of sediment-bearing water, but also of sewage, sludge, industrial wastes, chemicals and other fluids carrying solids in suspension or containing corrosive elements. In fact, because it can be built by any contractor on the job site, and because it requires little or no maintenance on the part of the operator, the Parshall Flume is widely used in small and medium sized sewage disposal plants throughout the country.

The free-flow capacities of different throat size Parshall Flumes, operating at heads as high as 30 inches, are given in solid lines in mgd. in Fig. 4, for handy use in determining the size of flume required to handle any flow condition. The resulting head losses for different size Parshall Flumes are also shown in dotted lines at the bottom of this figure.

Palmer-Bowlus Flumes

Another type of flume is the Palmer-Bowlus, which is used extensively on the West Coast for irrigation and sewage projects. It has the advantage that it may be built into an existing channel or other conduit, when the flow does not completely fill the line, by inserting wings or pads to the conduit to produce the desired restriction, or it can be built up separately, like a Venturi or Parshall Flume. For complete details see the ASCE Transactions, Volume 101 (1936), Paper 1948, entitled "Adaptation of Venturi Flumes to Flow Measurements in Conduits."

Nozzle Flume

Still another open flow measuring device is the Nozzle Flume. This is a trough shaped device which is attached to the open end of a pipe line as it discharges into a bay or cistern. It has a flat bottom and the outlet area is made smaller than the inlet

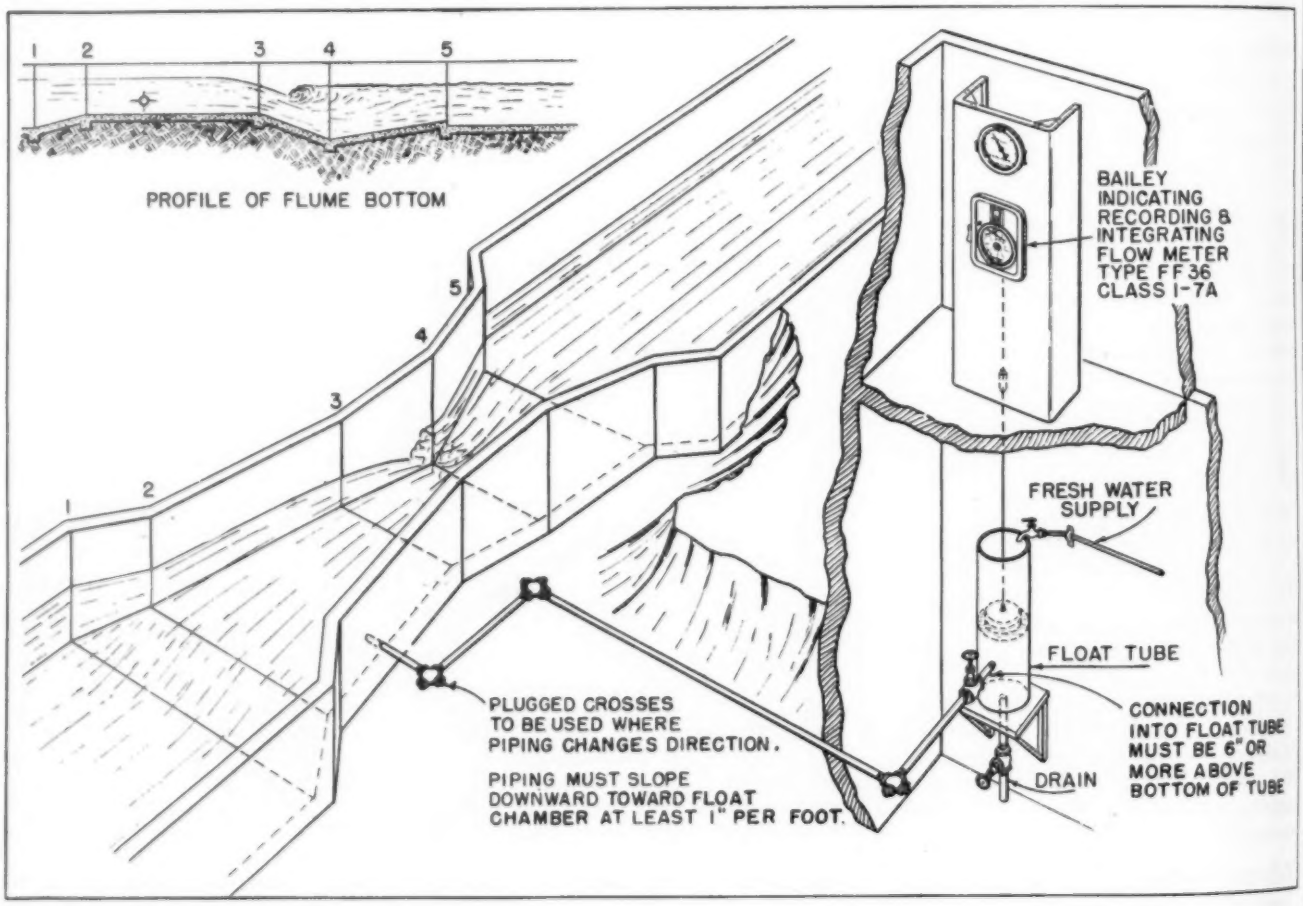

1
2
3
4
5
PROFILE OF FLUME BOTTOM
BAILEY INDICATING RECORDING & INTEGRATING FLOW METER TYPE FF 36 CLASS I-7A
FRESH WATER SUPPLY
FLOAT TUBE
CONNECTION INTO FLOAT TUBE MUST BE 6" OR MORE ABOVE BOTTOM OF TUBE
DRAIN
PLUGGED CROSSES TO BE USED WHERE PIPING CHANGES DIRECTION.
PIPING MUST SLOPE DOWNWARD TOWARD FLOAT CHAMBER AT LEAST 1" PER FOOT.

Fig. 2—Typical Installation of Float-Operated Meter with Parshall Flume.

to facilitate the measurement of level above the bottom. It, too, functions on the premise that the flow never completely fills the pipe line to which it is attached.

Selection of Proper Primary Element

In selecting the type and size of primary measuring element, therefore, the engineer must carefully weigh (1) the necessity for providing a self-cleaning device, (2) desired accuracy, (3) relative cost, including the availability of materials required, and (4) permissible head loss.

Generally speaking, when the flow is free of extraneous matter, the weir is the cheapest and most accurate device, but where the flow is sewage, sludge, or similar fluids, either the Parshall, Palmer-Bowlus or Nozzle Flume is well worth the additional cost.

It will be noted in both Fig. 3 and 4 that several sizes of weirs and flumes are available for a particular range of flow measurement. Naturally the smaller weirs and flumes must operate at higher heads, and this may require that expensive alterations be made in the channel preceding the weir or flume in order to accommodate the higher head. However, the cost of doing this when added to the lower cost of the smaller flume may well equal or exceed the cost of a larger weir or flume which will operate at a lower head.

The allowable head loss may be one of the most important controlling reasons in the choice of design and type of primary device to be used. Again referring to Fig. 4, it will be noted that head losses for Parshall Flumes are quite small; in fact, are approximately 25 per cent of those of any weir. For example, while a 4-foot throat Parshall Flume will measure a capacity of 15 mgd. at 15 in. head, with a recovery of 11 in. of this head and net loss of but 4 in., the same size rectangular weir would require an 18½ in. head, *all* of which is lost in the metering process. Thus where head loss is an important factor, particularly in irrigation projects and many sewerage projects, the higher cost of the Parshall Flume over that of the weir will be entirely justified. Especially is this true where pumping is involved.

No weir or flume size should be used which produces less than 5 in. head at the maximum flow. This is true because of lack of adequate power to operate the meter register satisfactorily.

Level Measurement

Fortunately, it is necessary to have but one connection to a weir or to a flume (if the flow through the Parshall Flume is free flow and not suppressed) in order to measure the level of water over the sill of the weir or throat of the flume, and consequently to determine its flow rate. This simplifies the meter mechanism considerably, for only one level detecting device is thus required.

The universally accepted, as well as the most adaptable, means of measuring the level or the height of liquid over a weir or flume is by means of a hollow float connected by a flexible cable to a suitable register located above it—Figs. 1, 2 and 5. By placing this float in a stilling

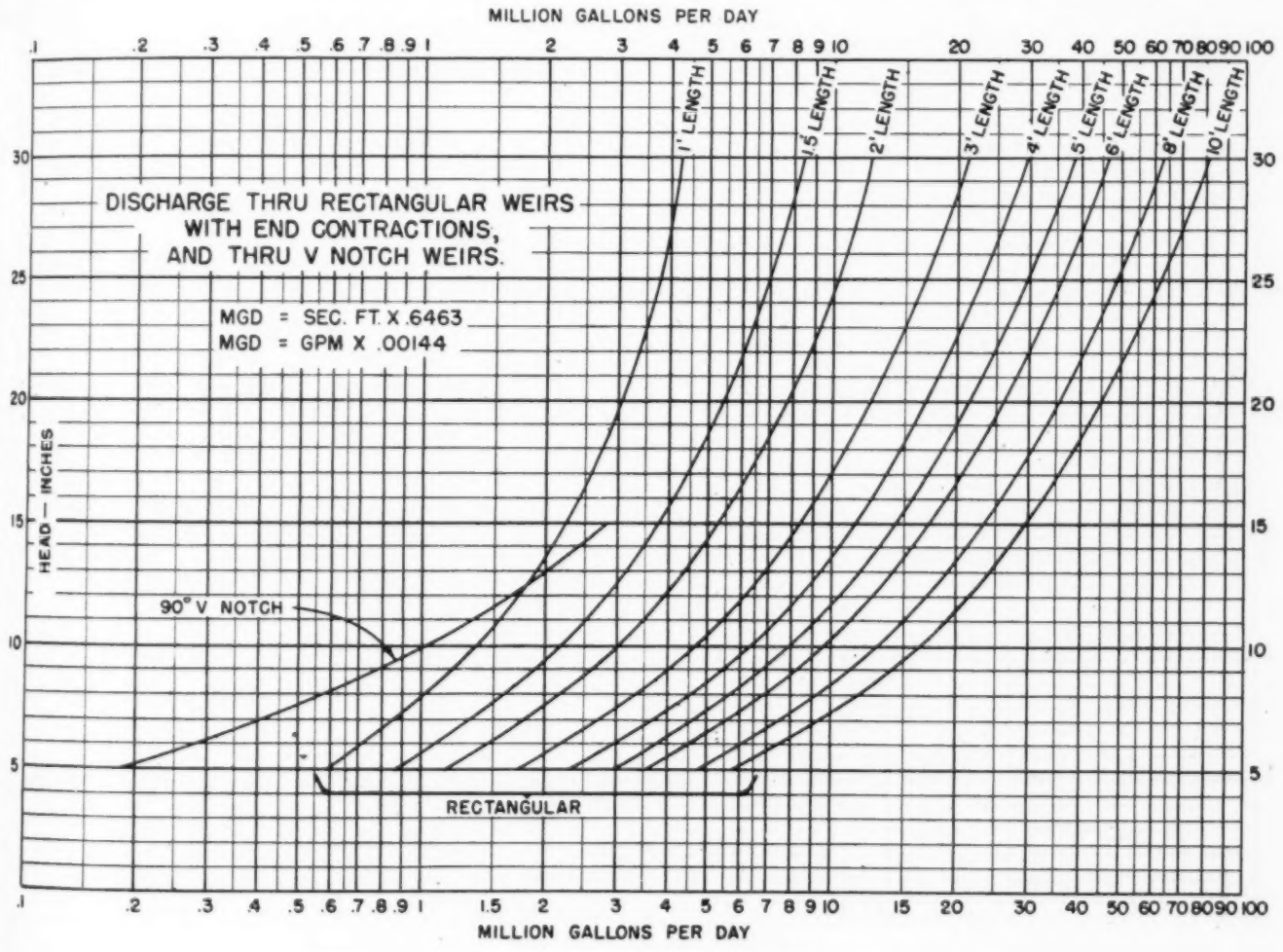

MILLION GALLONS PER DAY
.1 .2 .3 .4 .5 .6 .7 .8 .9 1 2 3 4 5 6 7 8 9 10 20 30 40 50 60 70 80 90 100
1' LENGTH
1.5' LENGTH
2' LENGTH
3' LENGTH
4' LENGTH
5' LENGTH
6' LENGTH
8' LENGTH
10' LENGTH
DISCHARGE THRU RECTANGULAR WEIRS WITH END CONTRACTIONS, AND THRU V NOTCH WEIRS.
MGD = SEC. FT. X .6463
MGD = GPM X .00144
HEAD — INCHES
90° V NOTCH
RECTANGULAR
5 10 15 20 25 30
.1 .2 .3 .4 .5 .6 .7 .8 .9 1 1.5 2 3 4 5 6 7 8 9 10 15 20 30 40 50 60 70 80 90 100
MILLION GALLONS PER DAY

Fig. 3—Capacities of Rectangular and V-Notch Weirs.

chamber slightly larger in diameter than the float itself, the vertical motion of the float is guided and the effect of waves or surges in the flume or channel is largely eliminated. The float chamber can be located directly under the register, thus simplifying the running of the connecting cable to the register above. The float chamber must be connected to the channel by means of a pipe at least 2 or 3 in. in diameter, so as to quickly and accurately transmit the true level in the channel to the float chamber.

Mechanical Register

The simple operating mechanism of a typical open channel register is shown diagrammatically in Fig. 5. The rise and fall of the float in the float tube is converted into rotary motion by the float cable sheave on which a flexible cable is wound. This rotation is transmitted through suitable gears to a cam which translates the level measurement into terms of flow in accordance with the characteristic of the weir or flume through which the flow is passing. The flow chart is thus evenly graduated and is read direct in any desired flow units. The total flow is read on a six figure cyclometer type integrator in the same units.

The flow cam, which conforms with the flow head relationship of the V-notch, rectangular, Cippoletti or trapezoidal weir, or of the Venturi, Palmer-Bowlus, Parshall or Nozzle Flume, as required, is readily interchangeable in the field. Should it be necessary to increase or decrease the capacity of the register or to use it with an entirely different weir or flume, the only change required is to replace the cam and change gears with new ones designed for the new measuring element.

Registers may be wall, panel, or pedestal mounted as best fits the needs for the individual installation and as shown in Fig. 1, 2, 6 and 7. Separate 10 in. dial indicators as shown above the register in Fig. 7 are also supplied when it is desirable to be able to read the register at a considerable distance.

Remote Registers

At times it is necessary that the register be located at a distance from the flume or weir. At others, one or more indicators remotely located must be provided in addition to the usual register, or again it may be necessary to totalize a number of different flows, or to provide a ratio control between two or more flows which must be measured at widely separated points. For all these applications and others of similar nature an Electronic Telemeter system is available.

The Transmitter is a simple float operated device which positions the movable core in a transformer in accordance with the level over the weir or flume. The Receiver is a standard Electronic Indicating, Recording and Integrating Instrument which, like the mechanical register, is calibrated to read directly in terms of flow. Externally these registers appear exactly like mechanical units and may be furnished in substantially the same combinations for either panel, wall, or pedestal mounting. Single or double faced indicators up to 42 in. in diameter are also available, either for indicating single flows or for totalizing a number of separate flows.

Principle of Operation

The electronic instruments described herein operate on the highly

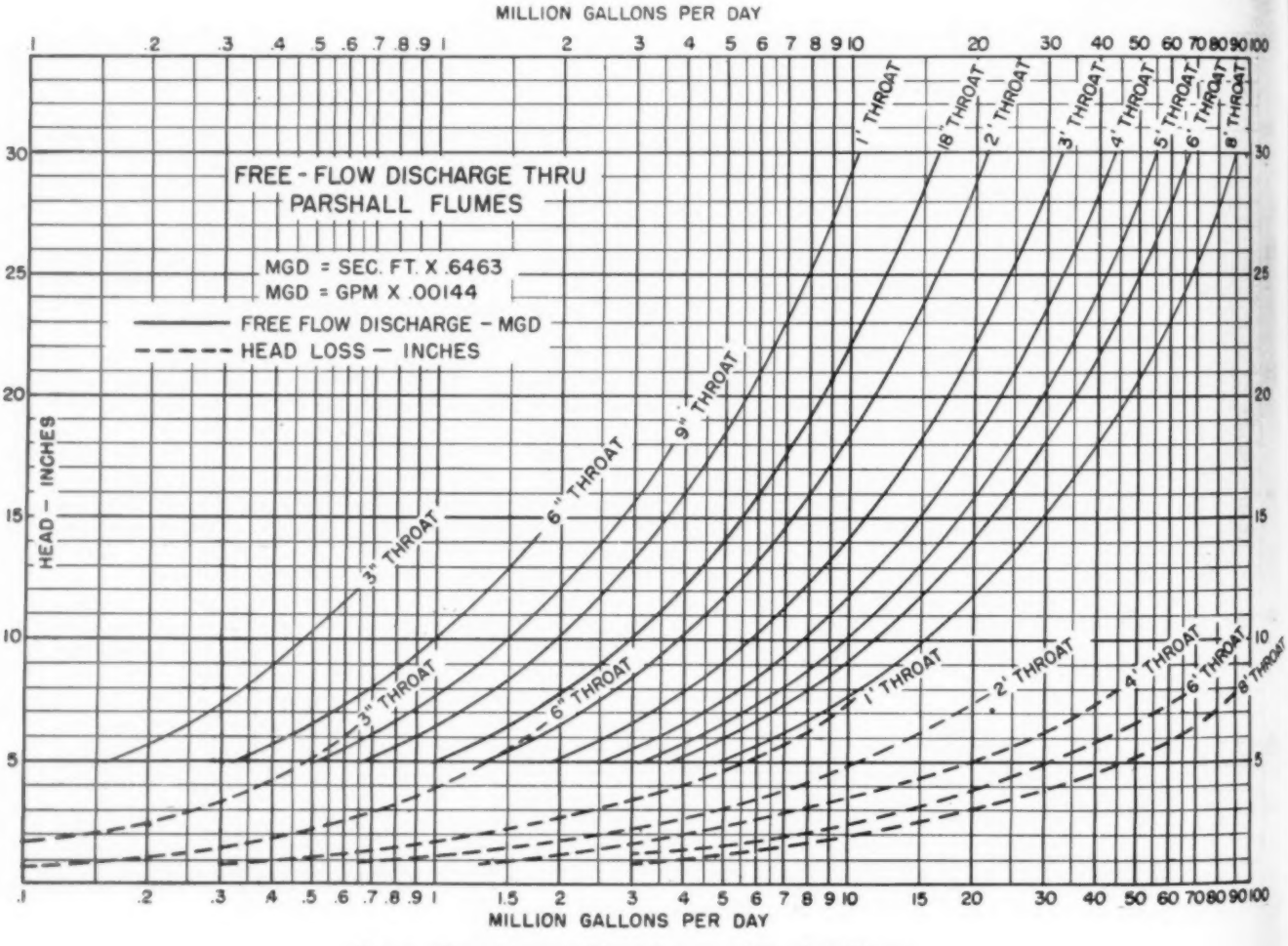


Fig. 4—Capacities and Head Losses of Parshall Flumes.

accurate null balance principle and provide fast and continuous balancing action by electronic detection and control.

The position of the transmitter core determines the magnetic flux linkage between the primary winding and the two secondary windings of the transmitter coil. The voltage thus induced in each of the secondary windings by the primary depends upon the magnetic flux linkage from the primary. The voltage ratio is thus proportional to the displacement of the core from its center position.

An electrical bridge is formed by the two secondary coils of the transmitter and the electrical elements in the receiver. An electronic amplifier and motor control circuit keeps this bridge in continuous balance by operating the motor driven receiver so that its position always corresponds to that of the transmitter core.

Unlike many telemeter receivers which build up operating torque slowly, this circuit can be considered as an electronic torque amplifier which requires practically zero input and which provides abundant power for the operation of recording pens, indicating pointers, control devices, alarm contacts and other instrument features. This characteristic insures accurate operation of the transmitter since there is practically no reaction to oppose movement of the transmitter core.

The bridge circuit obtains its alternating current supply from the power source for the instrument and no other source of voltage is required.

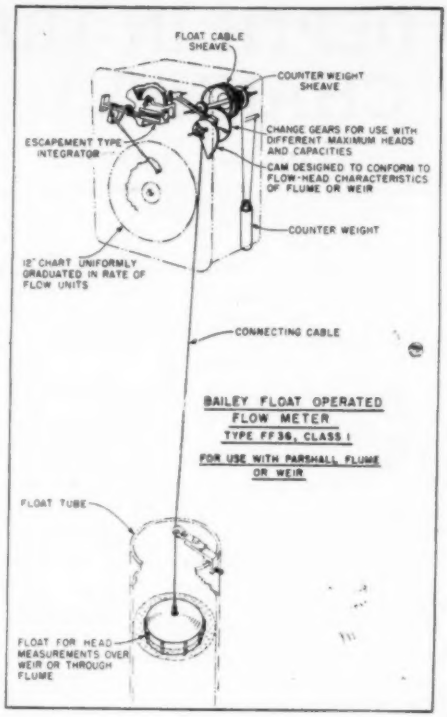

FLOAT CABLE SHEAVE
COUNTER WEIGHT SHEAVE
CHANGE GEARS FOR USE WITH DIFFERENT MAXIMUM HEADS AND CAPACITIES
ESCAPEMENT TYPE INTEGRATOR
CAM DESIGNED TO CONFORM TO FLOW-HEAD CHARACTERISTICS OF FLUME OR WEIR
COUNTER WEIGHT
12" CHART UNIFORMLY GRADUATED IN RATE OF FLOW UNITS
CONNECTING CABLE
BAILEY FLOAT OPERATED FLOW METER
TYPE FF36, CLASS I
FOR USE WITH PARSHALL FLUME OR WEIR
FLOAT TUBE
FLOAT FOR HEAD MEASUREMENTS OVER WEIR OR THROUGH FLUME

Fig. 5—Operating Mechanism of Bailey Open Channel Meter.

Fig. 6—Pedestal-Mounted Open Channel Meter on Parshall Flume.

Control Devices

Either the mechanical register or the Electronic Telemeter can incorporate an air pilot valve for the automatic control of flow, temperature, pressure, level and other factors.

A simple, inexpensive, contact device can be included for the operation of chemical feeding devices of standard manufacture. These contacts transmit electrical impulses whose frequency varies directly with the flow rate. They function through a suitable relay and feeder system to introduce a quantity of chemicals which is directly proportional to the flow rate.

Magnetically-operated mercury switches can be provided to sound alarms or to operate control relays. They can be field adjusted to function at any desired rate of flow.

Conclusion

It is apparent, therefore, that each meter installation presents an individual engineering problem which often requires the help and guidance of those experienced in the art. To this end the engineering and field staffs of the several meter manufacturers welcome the opportunity of assisting the user in determining the proper type of metering equipment for any specific job so that the best possible installation may be made.

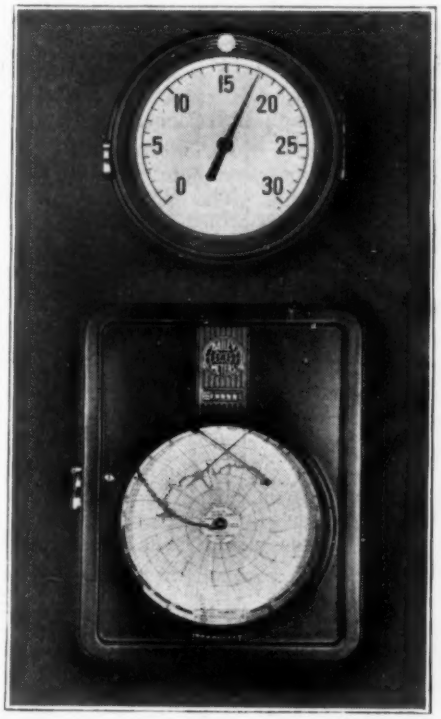


Fig. 7—Indicating, Recording and Integrating Register with Dial Indicator Above.

Commissioned Corps of Public Health Service to Be Branch of Armed Forces

Under an executive order signed by President Truman the commissioned corps of the U. S. Public Health Service on July 29 became a branch of the land and naval forces of the United States and will remain so for the duration of the war.

Administration of the Public Health Service is not affected by the executive order. The Service continues to operate as a part of the Federal Security Agency, but Public Health Service officers will be subject to the Articles of Government for the Navy. Officers on detail to the Army and Navy, however, will be governed by the service to which they are attached.

Under the executive order, commissioned officers of the service will be subject to the same discipline and obligations and will have the same status as members of the Army, Navy, and Coast Guard. Their postwar status will be the same as that of veterans.

FLOW AND DEPTH IN TRAPEZOIDAL CHANNELS

By PAUL McH. ALBERT
Shoecraft, Drury, and McNamee, Engrs.
ANN ARBOR, MICH.

IN THE June, 1945, issue of *Water Works and Sewerage* (Page 200), there appeared two nomographs by the author, for solving flow problems in circular conduits. Herewith is another nomograph, this one for solving flow problems in trapezoidal channels. In the accompanying figure, two very useful charts have been combined. On the left is the nomographic solution of the equation obtained from Manning's Formula. On the right is the logarithmic chart of d/b ratios for eight different shapes of channel, varying from vertical sides to a 4:1 slope. The two charts have a common line, the *Base Line*, which is graduated for values of the d/b ratio of vertical sides or rectangular sections.

The Author

Two straight lines intersecting at the *Pivot Line* complete the nomographic solution. The point on the *Base Line* thus obtained is then transferred horizontally to that scale of d/b ratios for the desired slope.

Sample Problem Solved

A sample solution is indicated on the chart. Here 36 cfs. is connected with 0.1 ft. per 1000 ft. and 7 ft. bottom width (b) with a point on the Base Line.

Notice that the graduation on the Base Line reads 0.76. The depth of flow (d), then, for a rectangular section 7 ft. wide would be 0.76 x 7.0 or 5.32 ft. deep. Now follow the dotted line over to the scale headed 1:1 and find there the value of d/b to be 0.5 or d equal to 3.5 ft. for a channel with side slopes of 1:1.

The d/b ratio for any other side slope can be as easily determined, or if the depth ratio in one given shape of channel is known, the depth ratio for any other given shape can be found immediately. The *bottom width* and the *flow* do not change unless the point on the Base Line is moved vertically. All values must be moved back and forth to the Base Line *horizontally*. The curved lines connect the major divisions of the various scales and are used solely to assist the eye in finding the divisions.

Construction of the Graph

Inasmuch as 0.025 is a common value of n used with earth channels, it was used for the construction of the nomograph. Other values of n may be used by shifting the Q scale up or down until the desired value of n is opposite 1.0 cfs. A convenient method of accomplishing this is to copy a cycle or two of the Q scale, in the ranges of your problem, on the edge of a sheet of paper and mark the position of 1.0 cfs. Then by placing the 1.0 cfs. mark against the desired value of n, the Q scale has been shifted and the copied scales will give values of Q for the new value of n.

The sample equation solved on the nomograph was obtained from Manning's Formula in the following manner. Q/A was substituted for V and then A/p for r (p being the wetted perimeter). Then A and p were expressed in dimensional terms, namely: b, the bottom width; d/b, the ratio of the depth of flow to the bottom width; and the angle ø formed by the side slope and the horizontal. By transposing and combining like terms the equation was formed as shown on the chart.

The last term in the equation, in parentheses, is the factor used in constructing the scales for the side slopes. The numerical values of the factor were used to locate the position of the graduations of the ratio d/b but only the d/b ratios are given in the chart.

Comments

All the primary dimensional variables which are needed for a solution are contained in the chart. Any one, two, or more of them may not be known and often only Q is known and others must be assumed to arrive at a satisfactory answer. It matters but little which are the given values. Other values may be immediately assumed and the answer obtained in but a moment.

All other variables as, velocity, area of section, hydraulic radius, etc., can be calculated, if necessary or desired, for all the physical dimensions are known.

Most of the ordinary problems can be solved with the chart inasmuch as the ranges of the variables include a 1 foot wide rectangular channel flowing but a few inches deep to a 20 foot wide channel flowing 40 ft. deep.

The problems involved are those where uniform flow conditions will be satisfied. For conditions where other than uniform flow is encountered, other methods of analysis must be used.

RFC Loans for Public Works

On Oct. 2nd it was announced that low interest rate loans from the Reconstruction Finance Corporation are immediately available to municipalities and other public bodies to aid in financing public construction projects.

Projects eligible for RFC financing may include the construction or improvement of municipal water supply and distribution systems, sanitary sewers and sewage disposal plants as well as other municipal facilities and buildings.

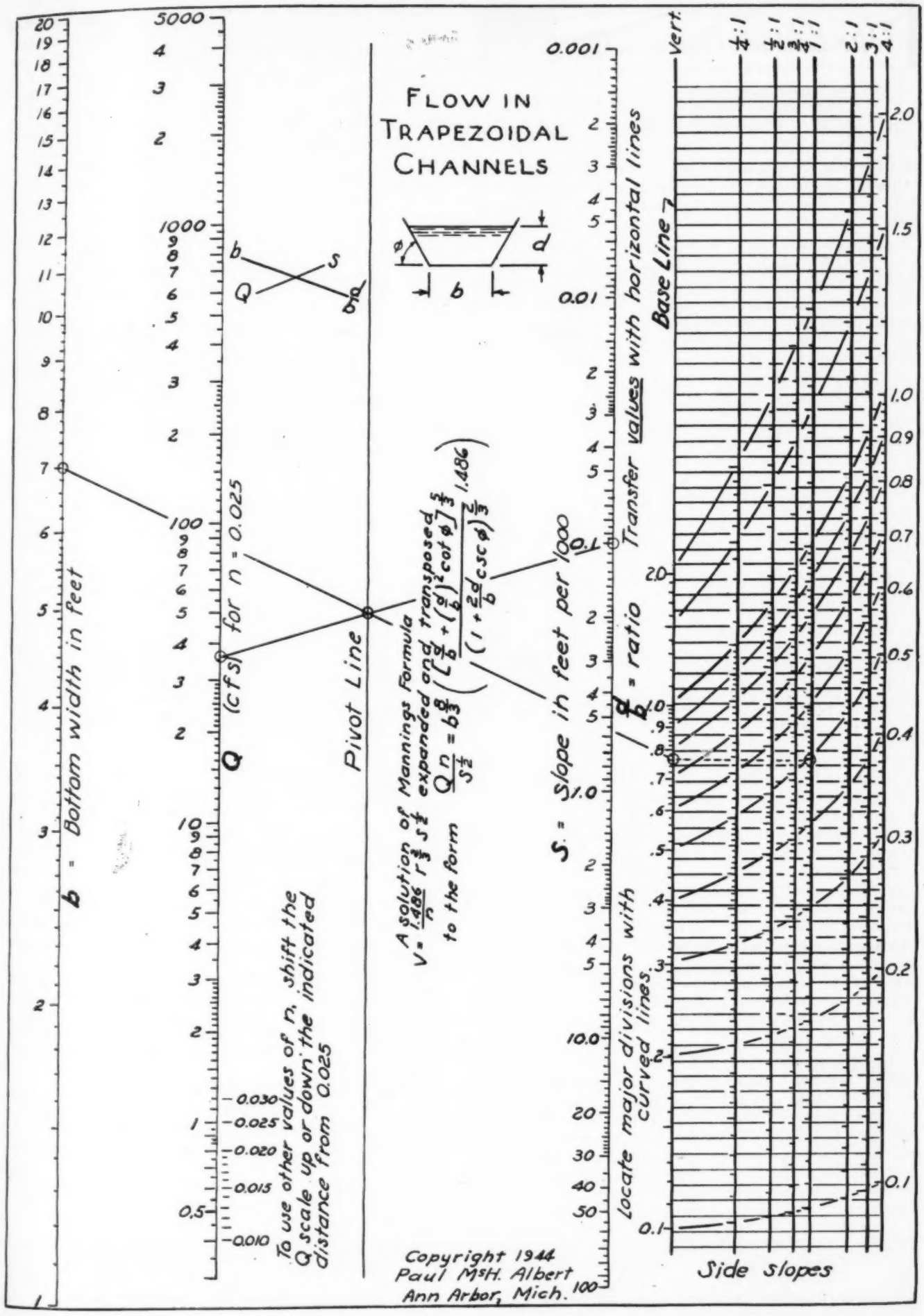
Borrowers eligible for financial aid under the RFC Act include cities, towns, villages, counties, states, school and park districts, public boards and commissions, authorities and other public corporations or agencies. RFC will consider financing up to 100 per cent of the cost of the project, or RFC will cooperate with banks or other lenders in making loans.

Loans will in most cases be of the type repayable from the earnings of the project that is financed, such as water or sewer service charges, etc., as may be permitted by State law. This kind of loan is usually made through the purchase of revenue bonds from municipalities.

Under the RFC plan of disbursing loan funds as needed from time to time, instead of all at one time, important interest savings can be achieved while the project is under construction. For example, instead of purchasing a city's entire bond issue at one time, RFC will contract to purchase the city's bonds from time to time over a period of months or years, if necessary, throughout the entire construction period.

The loan commitments may be issued by RFC immediately upon approval of loan applications. Loans will be available for repayment upon a long or short term basis. The municipal borrower must be authorized under State law to carry out the project for which RFC financing is given.

Loan application forms or further information may be obtained from the Washington office of the RFC, Self-Liquidating Division, which will process all applications. Copies of Circular No. 22 giving information about such loans to public agencies are available upon request at the Washington office of the RFC or at any RFC agency in principal cities throughout the country.


FLOW IN TRAPEZOIDAL CHANNELS
b = Bottom width in feet
Q (cfs) for n = 0.025
Pivot Line
S = Slope in feet per 1000
d/b = ratio
Transfer values with horizontal lines
Base Line
Vert.
4:1
3:1
2½:1
2:1
1½:1
1:1
2:1
3:1
4:1
Side slopes
Locate major divisions with curved lines.
To use other values of n, shift the Q scale up or down the indicated distance from 0.025
0.030
0.025
0.020
0.015
0.010
A solution of Mannings Formula
$V = \frac{1.486}{n} r^{\frac{2}{3}} s^{\frac{1}{2}}$ expanded and transposed to the form
$\frac{Qn}{s^{\frac{1}{2}}} = b^{\frac{8}{3}} \left(\frac{\frac{d}{b} + \left(\frac{d}{b}\right)^2 \cot\phi}{\left(1 + \frac{2d}{b} \csc\phi\right)^{\frac{2}{3}}}\right)^{\frac{5}{3}} 1.486$
Copyright 1944
Paul MsH. Albert
Ann Arbor, Mich.

The Editor's Comments

Postwar Problems and AWWA

In a symposium on "Postwar Problems" featured by the North Carolina Section during its recent meeting in Charlotte, N. C., the writer pointed out what to his thinking constitutes the four most important considerations for the water works profession in the postwar period. These were—

(1)—The provision of ample supply storage facilities scientifically located on the distribution system to provide not only an ample immediately available fire supply, but the insuring of normal pressures of almost constant proportions on the customers' premises at all rates of demand, while at the same time extending the useful life of pipe in the distribution system, and also reducing pumping costs.

(2)—A continuing search for the most effective and universally dependable methods for controlling tastes and odors in treated waters. While much progress has been made in taste and odor control by water purification men, more needs to be done, including methods of determining sufficiently in advance just when and which process to employ in order to knock out the first taste or odor slug of water which frequently slips by the plant.

(3)—The more prevalent use of non-corrosive metals and materials, or pipes adequately protected with cement or other linings in distribution systems and for service lines is advocated until such time as wholly adequate and predictable water treatment processes for corrosion suppression are available. While treatment to reduce the corrosivity of water has proved helpful, there appears to be ample opportunity for further improvement in the direction of a maintained stability of the treated water from the plant to the ends of the system. What is best for cold water conditions and the mains has too frequently proved bad practice in connection with hot water systems. If chemists cannot find the "universal process," the minimum number of processes which may be considered predictable as to attainments is the goal which should be striven for. Until chemists can say (and prove) that we are no longer dependent upon what materials pipes, valves and meters are made of, only then will the problem of water treatment at reasonable cost for corrosion and tuberculation elimination have been solved. After many years of contact with the problem, we are beginning to wonder if water treatment alone without due regard for materials or protective linings can ever be perfected to the point where overall practicability and economy is to be the net result.

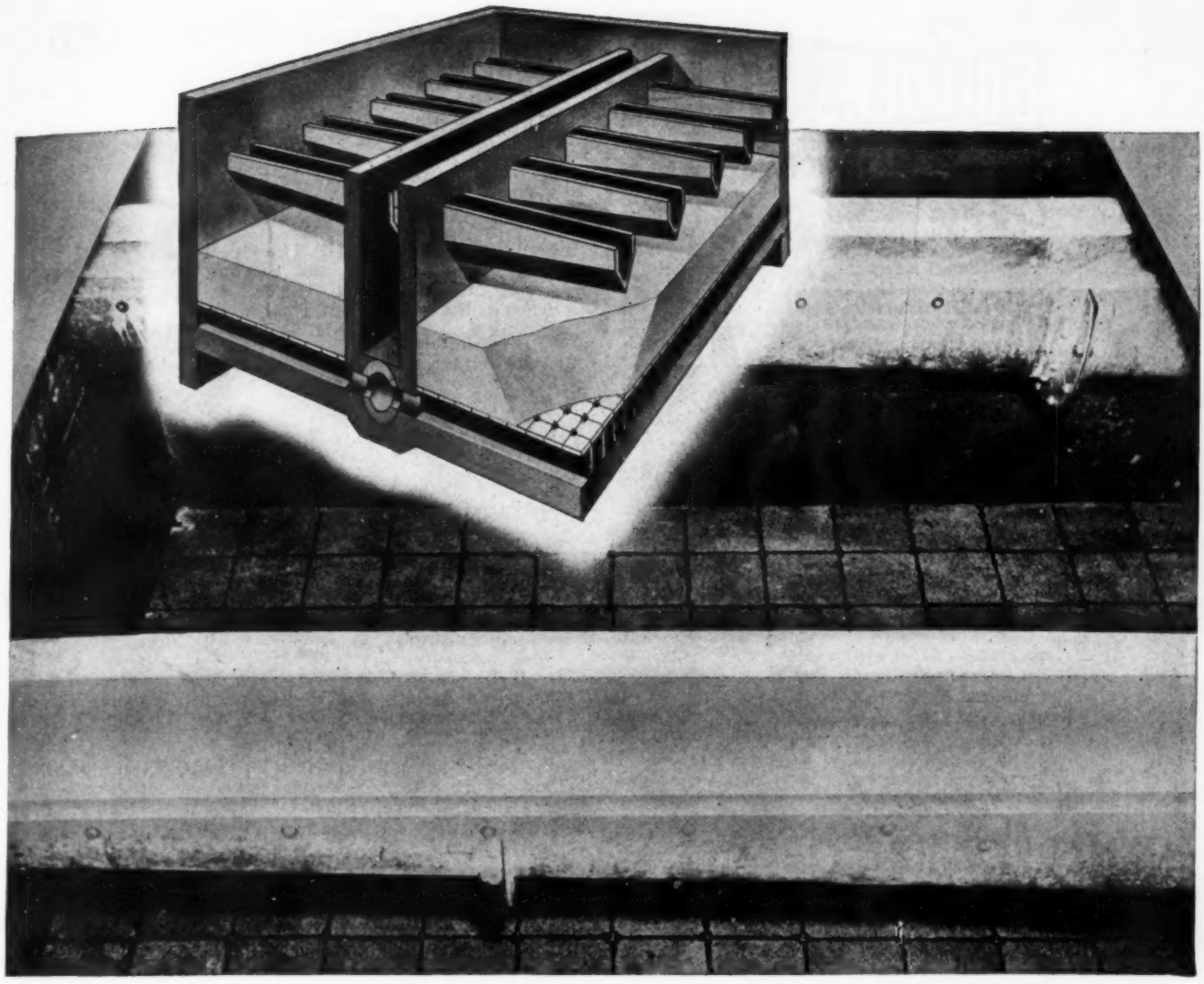
As a whole, the water works profession is more frequently damned because of the three shortcomings just referred to than any others. These are—poor pressure and miserly faucet flows in peak demand periods, deficiencies in palatability of the product, and the effects and results from corrosion of mains, piping and household hot water facilities. That these three items need further consideration and attention hardly requires emphasizing to the experienced operator. However, there is a fourth item of marked import in the category of postwar problems. Unfortunately, this fourth problem has not received a fraction of attention or interest which the first three have received. It is a problem of considerable importance to *every* water works man.

(4)—The fourth problem for postwar attention the writer emphasized as prevalently the most neglected of all of the problems discussed. It is that of advancing the status and standing of the water utility in the eyes of the people at large. It is already evident that much can be accomplished in this direction by observing the standing of water utilities serving individual communities. Some are damned; others are just taken for granted until troubles occur to bring condemnation. Only a relatively few water managements are praised by the local administration (fewer still by individual citizens) for their accomplishments and service rendered. This is a lamentable circumstance.

We have often said that as technicians, managers and conscientious workers, the average water works man is all that could be desired. On the other hand, as salesmen they are probably the world's poorest. They shy away from all lime-light and all forms of publicity. They cannot understand why their work is not more appreciated, why the public shows so little interest. The net result is that water works men become just about as obscure as they make themselves. As a consequence the water utility becomes the least well-known of the four utilities, water, gas, electricity, telephone. This fact was disconcertingly well demonstrated in Washington when the Office of War Utilities was created early in the war and the priority system covering materials for utilities was set up. Amongst the utilities, the water utility was once again all but completely overlooked (probably just taken for granted again) until Jordan and Wolman, and a handful of others representing America's water supply industry, were successful in getting top priorities established for essential water supply materials, and eventually a special water division established and thoroughly staffed in O. W. U. Through these efforts water supply won its place in the scheme of "first things first" in Washington. At no time as during World War II had industry, the government, or the public-at-large such an opportunity to realize the high value and essentiality of adequate and dependable water supply. But the public's memory is short.

What early transpired in Washington, illustrating the lack of any sort of national appreciation of the importance of water supply to the nation, and also the relatively low recognition of the worth of key water works men in respect to remuneration when contrasted to prevailing salary scales for similar responsibilities in industry, has been the cause for the launching of a postwar program by the American Water Works Association which is designed to secure increasing recognition for the water supply enterprise of America. AWWA has now a committee of national scope at work studying ways and means of bringing water utilities into greater prominence and securing recognition of services rendered, and also more adequate scales of remuneration for water works personnel as a natural consequence of the higher appreciation of values too long obscure.

In recounting the anticipated benefits to come from this program of AWWA's, vice-president La Due recently emphasized the hoped-for improvement in remuneration as an expected natural consequence of the higher nation-wide standing of water utilities. Then he aptly lamented that "as good as they are, few water works men are courageous enough to appear before the public for their true worth." It is the hope of the present AWWA administration that this prevalent weakness of water works managements can be corrected through the Association's excursion into water utility publicity, and advancement of the social and economic status of water works personnel as a natural consequence thereof.—L. H. E.



The simple "ALOXITE" Underdrain System Eliminates all Graded Gravel!

CORROSION-resistant "ALOXITE" ceramically bonded aluminum oxide plates carry the filter media directly! There is no graded gravel to become upset and cause inefficient filtration, inadequate backwash, mud balls—and ultimate rebuilding expense!

Backwash is always complete and uniform . . . often requiring less water than other systems. Filtering and backwash operating heads are reduced.

You can adapt an "ALOXITE" porous underdrain system to large, small, gravity or pressure units... usually realizing the same advantages. And this system does not require new structures . . . it can be fitted into the filters you have now.

Let our technical staff show you how an "ALOXITE" underdrain system may solve your filter operation or construction problems. Just write to The Carborundum Company, Refractories Division, Dept. W-6, Perth Amboy, N. J.

"CARBORUNDUM" and "ALOXITE" are registered trade marks of, and indicate manufacture by, The Carborundum Company

Porous Products by CARBORUNDUM TRADE MARK

BUILDERS

WATER AND SEWAGE WORKS *Equipment*

Venturi Meters
Bulletin 293C
Type M and Flo-Watch Instruments
Bulletins 324A and 318B
Venturi Effluent Controllers
Bulletin 321A
Filter Gauges
Bulletin 329
Liquid Level Gauges
Bulletins 326 and 329
Sand Expansion Gauges
Bulletins 335 and 348
Kennison Open Flow Nozzles
Bulletin 334A
Chronoflo Telemeters and Controllers
Bulletin 320A
Toledo-Chronoflo Conveyor Scales
Bulletin 322
Proveloflo Meters
Bulletin 350A

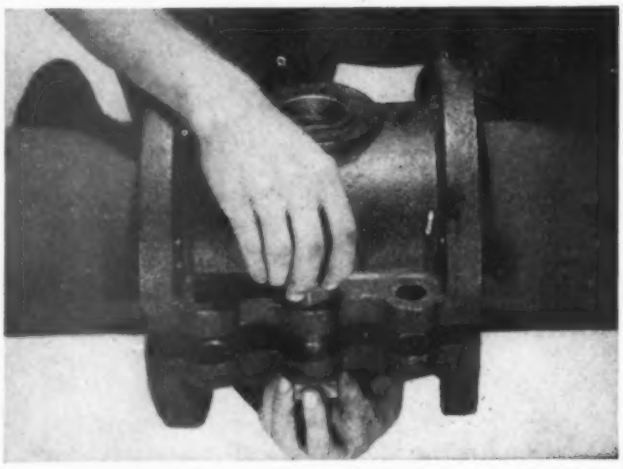
Check bulletins desired, attach to your letterhead and mail to:

BUILDERS-PROVIDENCE, INC.
(Division of Builders Iron Foundry)
24 Codding St., Providence 1, R. I.

Sincerely

BUILDERS-PROVIDENCE

For QUICK Repairs In Emergencies



Doublex Simplex Repair Sleeves can be installed by one man. A wrench only tool required.

DOUBLEX SIMPLEX SPLIT SLEEVES permit quick, economical, effective repairs of broken pipe. They can be "worth their weight in gold" in cases of unexpected serious repair problems. Moderately priced, so no great investment is necessary to keep several on hand for emergency use. Available for 3" to 36" cast iron pipe. Write our nearest office.

American Cast Iron Pipe Company

Birmingham 2, Alabama
Sales Offices in Principal Cities

MEETINGS SCHEDULED

Nov. 15-17—MIAMI BEACH, FLA. (McFadden-Deauville Hotel)
Florida Section A.W.W.A. Sec'y-Treas., Prof. A. P. Black, University of Florida, Gainesville, Fla.

Dec. 1—PHOENIX, ARIZONA
Arizona Sewage and Water Works Association. Sec'y, George Mar, State Public Health Dept., Phoenix, Ariz.

Dec. 6-7—MITCHELL, S. D. (Lawler Hotel)
South Dakota Water and Sewage Works Conference. Acting Director, Quintin B. Graves, Div. Sanitary Engineering, State Board of Health, Pierre, S. D.

Dec. 12—AUGUSTA, ME.
Maine Water Utilities Association. Sec'y, Earle A. Tarr, Supt., Water District, Winthrop, Me.

Dec. 13-15—BALTIMORE, MD. (Lord Baltimore Hotel)
Four States Section A.W.W.A. Sec'y-Treas., H. Lloyd Nelson, 1624 Lincoln Liberty Bldg., Philadelphia 7, Pa.

Jan. 10-11, 1946—LAFAYETTE, IND. (Purdue University)
Industrial Waste Conference. Chairman, Don. E. Bloodgood, Assoc. Prof. of San. Engr'g., Purdue University, Lafayette, Ind.

Jan. 15—NEW YORK CITY, N. Y. (Hotel Pennsylvania)
New York Section A.W.W.A. (Host Luncheon Meeting) 12:30 P.M. Sec'y-Treas., R. K. Blanchard, 50 West 50th Street, New York 20, N. Y.

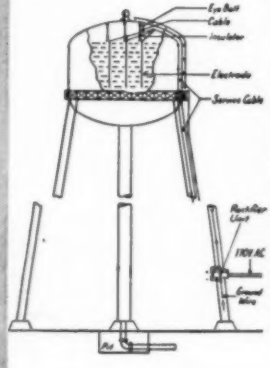
Jan. 16-18—NEW YORK CITY, N. Y. (Commodore Hotel)
American Society of Civil Engineers. (Annual Meeting) Sec'y, Col. Wm. N. Carey, 33 West 39th Street, New York, N. Y.

Jan. 18—NEW YORK CITY, N. Y. (Hotel Pennsylvania)
New York State Sewage Works Association. Sec'y-Treas., A. S. Bedell, State Department of Health, Albany, N. Y.

Mar. 28-29—ELMIRA, N. Y. (Mark Twain Hotel)
New York Section A.W.W.A. Sec'y-Treas., R. K. Blanchard, 50 West 50th Street, New York 20, N. Y.

HOW TO RUST-PROOF SUBMERGED METALS... *Permanently*

DC electric current of low voltage, low amperage, properly balanced and controlled as required by the water through which it passes and the metal it is to protect, prevents corrosion of the metal by oxygen in the water. It therefore *stops rust formation by oxidation.* This is the Electro Rust-Proofing System of Cathodic Protection. It has been applied to thousands of tanks, standpipes, deep wells, flocculators and many other types of water storage and water handling equipment. It is *engineered* to every installation. It stops the formation of rust below the water line totally and permanently, therefore kills the greatest single item of tank maintenance cost, the major cause of tank depreciation. Recognized and advocated by independent authorities. Write for free data.



ELECTRO RUST-PROOFING *Corporation*

DAYTON 10, OHIO, U. S. A.

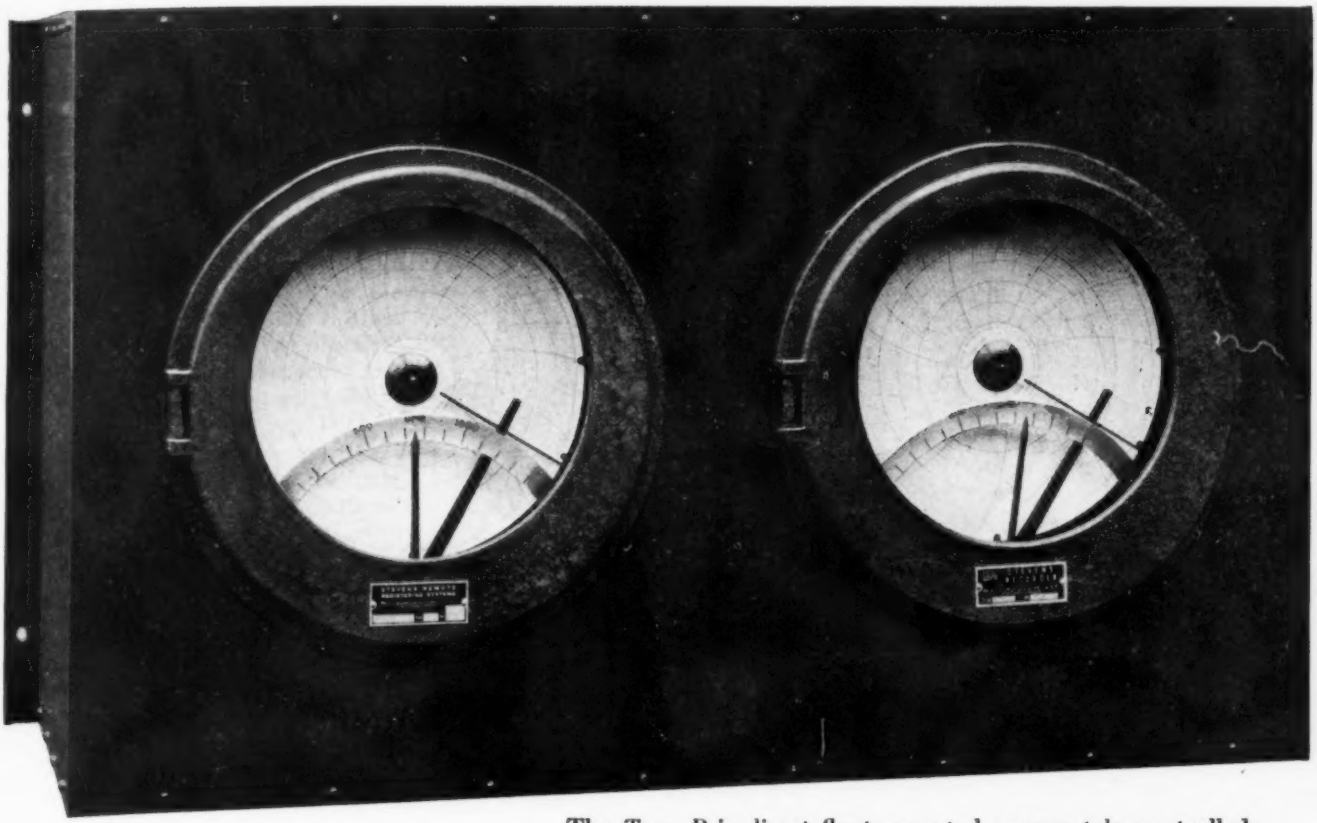
STEVENS TYPE B RECORDER DOES 3 JOBS WELL

The user list of Stevens *Type B* Recorder reads like a Blue Book. Reason — the instrument is particularly adapted to waterworks, sewerage and industrial applications — and is equally suitable to any class of recorder service.

Type B is really *triplets*. It records and indicates either head or rate of flow and registers total volume passed in any elapsed time.

Circular charts are used and may be had for daily or weekly operation.

✔ **RECORDS AND INDICATES HEAD OR FLOW** ✔ **TOTALIZES FLOW**



The *Type B* is direct float operated or remotely controlled. Quality 8 day or electric clock is standard equipment. The recorder can be mounted on wall, pedestal, panel, or in sewer manhole. It can be hermetically sealed against corrosive fumes.

Want more information about this 3-way wonder? Write for Bulletin 25.

LEUPOLD & STEVENS INSTRUMENTS

MANUFACTURERS SINCE 1907

PORTLAND 13, OREGON

Hydrographic, Surveying, Navigation, Automatic Controls

Leupold & Stevens Instruments
4445 N. E. Glisan St. Portland 13, Oregon
Please send Bulletin No. 25 on the Stevens *Type B* Recorder.

Name _____

Organization _____

Title _____

Street _____

City _____ *Zone* _____ *State* _____

Build Good Will with
HYDRODARCO

Standardize on Hydrodarco and give your community water that always tastes right. Hydrodarco is the quality activated carbon designed specially for water works use. It does a real job in eliminating odors and bad-tasting impurities. You can depend on Hydrodarco's performance—and maximum palatability control per dollar.

HYDRODARCO
REG. U. S. PAT. OFF.

HYDRODARCO REG. U. S. PAT. OFF.

DARCO
CORPORATION
60 East 42nd Street, New York 17, N. Y.

Distributing Points: New York • Buffalo • Cincinnati • Chicago • St. Louis
Kansas City • San Francisco • Los Angeles • Marshall, Texas

Here and There with Doc Symons

Here's That Man Again. You missed **H & T** last month (I hope) along with several good articles, a number of news items, and a whole string of notes and comments on equipment, manufacturers, and catalogs. Yes, this column, along with a great many other pages of reading matter, fell victim to the printers' strike in October and had to be omitted from what our editor calls our Bob-tail issue.

As a result of that three week delay there are several stories I had planned for the Nov. issue that will be delayed a bit—stories like that one about Jack Radcliffe's horseshoe pitching in New Jersey; Dr. Bartow's addition to our history of the Ill. State Water Survey; and items about Stu Coburn in Hawaii, Wendell LaDue, and Joe Kieffer of Syracuse, as well as several others—but they will come soon; meanwhile, read on and catch up on what you missed last month.

* * * *

Report to the Nation. "What's this about you being sick?" a fellow said to me. "You don't look like you ought to kick, what can the trouble be?"

That question drew the prompt reply: "This is my tale of woe. My sewage system is awry. - - - Too fast - - - and then too slow."

"Could it be appendicitis?"

"No, that small thing is out."

"Is it diverticulitis that you are pained about?"

"'Yes, that is it, those divertics, that all the troubles bring. - - - Spastic colon with its tricks, that make the sigmoid sting. Not yet the knife in me will sink. That's what the X-rays show. Right now, it's watch the food and drink, and on the work go slow.

"Egad! I thought I'd given up all pleasures that one should: Cigarettes and the coffee cup, and liquids aged

It is estimated that 40 miles of reinforced concrete pipe (24" to 72") will be used to drain Idlewild—New York's new 5,000-acre airport. Picture at Idlewild in August, 1945, by Jay Downer, engineer, Wharton-Greene associate.

Where big planes land — *it's* CONCRETE

Of course, the most modern airports have concrete runways. But some people do not realize that underneath the concrete pavement of the modern airport is concrete pipe in drains, culverts, and sewers. Hundreds of miles of such pipe, ranging in diameter from 6 inches to 108 inches, have been used because concrete pipe has the following positive advantages:

1. **Great strength**
2. **Long life**
3. **Maximum hydraulic capacity**
4. **Moderate first cost, low annual cost**

Information on specifications and installation of concrete pipe lines is available to engineers and officials planning drainage, water supply or sewerage projects. Free in the United States and Canada.

PORTLAND CEMENT ASSOCIATION

Dept. A11-29, 33 W. Grand Avenue, Chicago 10, Illinois

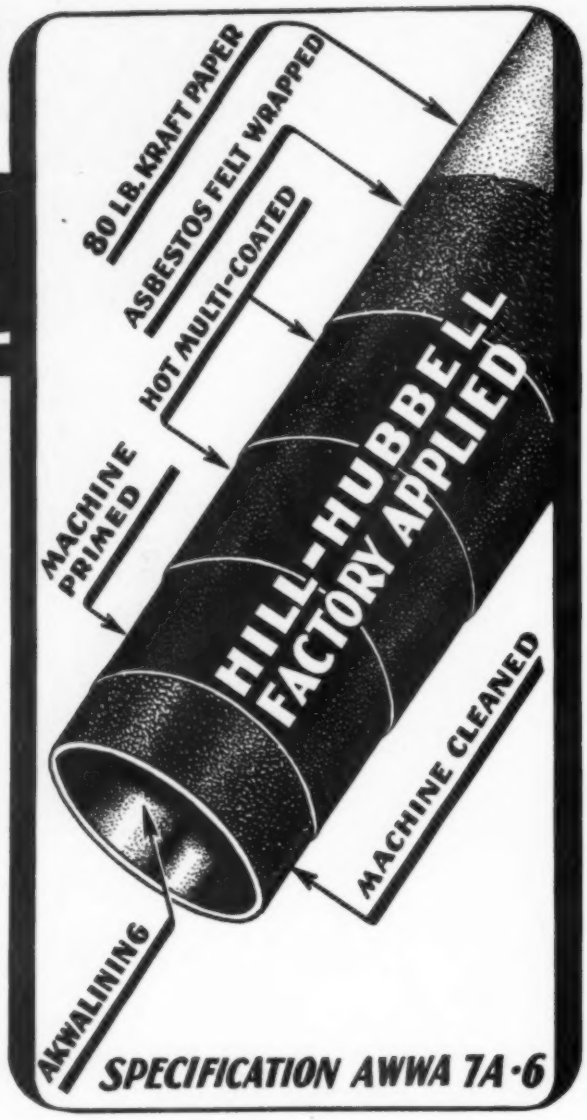
A national organization to improve and extend the uses of concrete . . . through scientific research and engineering field work

BUY VICTORY BONDS

PROTECT Your INVESTMENT WITH

HILL-HUBBELL

STEEL PIPE PROTECTION



WRITE FOR AWWA 7A .6 SPECIFICATION BOOKLET, ALSO OUR LITERATURE

Hill-Hubbell Factory Applied Steel Pipe Protection Insures Bottle-Tite, Shatter Proof Installations, with Permanent High "C' Factor Efficiency.

GENERAL PAINT CORPORATION
HILL, HUBBELL & CO. • Division • Cleveland, Ohio
• EXPORT OFFICE: SAN FRANCISCO, CALIFORNIA, U. S. A. •

in wood. Restricted this, forbidden that; two pills at ten and four. In bed by ten and stretch out flat, and sleep nine hours or more. And thus they have me on the run. 'Not this, not that.' - - - 'I won't.' You wouldn't think I have much fun. The answer is, 'I don't'."—G. E. S.

* * * *

In September, there appeared in the main reader pages of this magazine an article, by yours truly, on the subject of killing flies. The article having been written before the end of the war, hardly anticipated the minor flood of DDT into the commercial market. Nor was I ready at that time to say, as some have since, that DDT would make obsolete and antiquated all other forms of insect control.

Certainly it has begun to appear that these new organic chemicals bid fair to eliminate one of our major insect and health problems. Whether or not the electric fly trap will disappear before it even becomes well known, is something I hesitate to predict. On the other hand it was interesting to read just after the article was set in type, that Ed Decher at the Joint Meeting in Elizabeth, N. J., had tried out DDT with marked success.

In the Joint Meeting Annual Report, Ed reports that he has tried the material for two months. "In previous years," said Decher, "during the months of July and August, the fly situation at the treatment plant was a very troublesome problem. In fact, when barging operations took place at night, great swarms of flys were attracted by the lights . . . and in order to go inside the building it was necessary to spray some insecticide before attempting to open the doors . . ."

Through the courtesy of Dr. Rudolfs, Ed obtained some DDT and reports that since using this material on the screens and doors, "the flies in the building can be counted on one hand, and at no time will you find flies on the screens. As the material is poisonous when mixed with kerosene, its application must be handled very carefully. The elimination of flies from the interior of the building has greatly improved the sanitary and health conditions at the treatment plant."—Just what I was saying in September.

* * * *

One of my weekly private reading room assignments is the *Sullivan* (Ill.) *Progress* and in one issue I ran across this little item. I've read it after every issue of W.W.&S. has hit the local newsstands—I think you, and ye editor might like it too.

"The typographical error is a slippery thing and sly;
You can hunt until you're dizzy, but it somehow will get by.
'Til the forms are off the press it is strange how still it keeps
It shrinks into a corner and it never stirs or peeps.
The typographical error, too small for human eyes,
'Til the ink is on the paper, when it grows to mountain size.
The boss, he stares with horror, then grabs his hair and moans
The proofreader drops his head upon his hands and groans.
The remainder of the issue may be clean as clean can be,
But that typographical error is the only thing you see.
(Author Unknown)

That Mr. Unknown surely said a mouthful, eh, Ed?

* * * *

Back from the Wars: When Maj. Andy Fuller, Sn. C., CBI Theater, etc., showed up in civies in the Al-

bany Office of the N. Y. State Dep't. of Health, someone asked if he was ready to go back to work. "Yes," said Andy, "I'm just waiting for Devie [Devendorf] to give me a broom." Whereupon he was sent back to the Geneva, N. Y., District Office, which he left about four years ago.

Tom Riddick, Maj. USPHS(R), home from Ethiopia, is back in his New York consulting office and is again dispensing laboratory and operating supervisory services (plug) which Lee Purcell handled during Tom's absence.

* * * *

By the time this appears in print there should be in my mail letters or score cards (golf) from Smoke Clement, Shorty Germond, Jim Allen and Bob Mowry. They're the fellows, you know, who are competing for a cup to be donated by this column. The cup will be awarded for the best improvement in a golf score over that published in this column in our May issue.

* * * *

Larry Lingnor, now in the Navy, but once in our Chicago office, spotted this in *Time* Magazine—"In San Antonio, a survey of the water supply problem was prepared by Engineer Frank Drought."

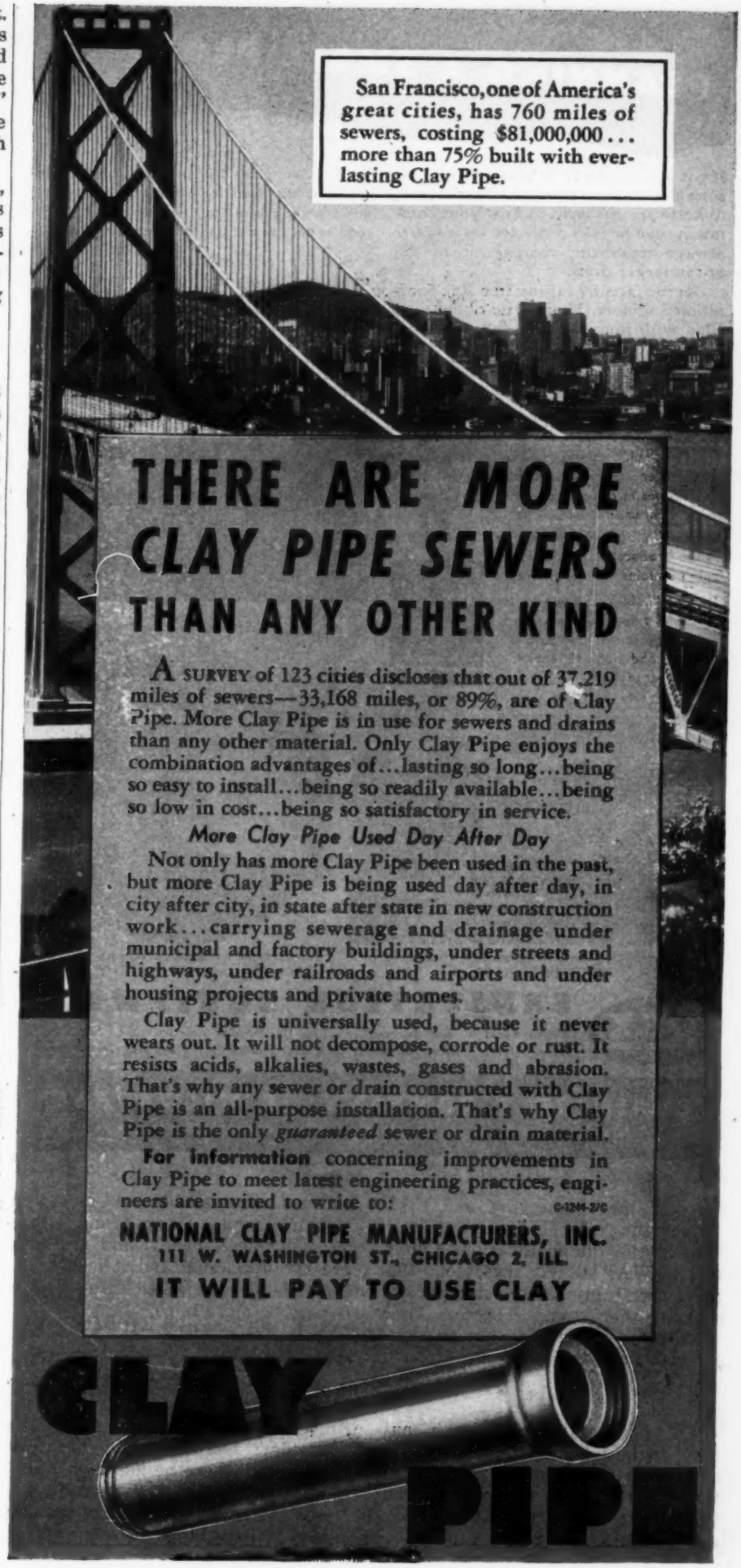
* * * *

Wasn't it in September that I had some correspondence from Sam Newkirk, erstwhile Pres. of AWWA, about the adoption of a more sensible system of weights and measures. Well, just to show you how much Sam really knows about the antiquated system, herewith is a statement in his own handwriting explaining the origin of the rod. The question was posed by one L.H.E. of W.W.&S. on a train to Calif. last year and herewith a reproduction of the Authority's answer.

The length of the left foot of sixteen men lined up as they left church on Sunday morning was the lawful rod in the 16th century.

* * * *

Any of you fellows philatelists? If you are, do you know that there are 16 different phases of engineering depicted on postage stamps, some of which are water works scenes? This bit of information comes to you


San Francisco, one of America's great cities, has 760 miles of sewers, costing $81,000,000 ... more than 75% built with everlasting Clay Pipe.
THERE ARE MORE CLAY PIPE SEWERS THAN ANY OTHER KIND
A SURVEY of 123 cities discloses that out of 37,219 miles of sewers—33,168 miles, or 89%, are of Clay Pipe. More Clay Pipe is in use for sewers and drains than any other material. Only Clay Pipe enjoys the combination advantages of...lasting so long...being so easy to install...being so readily available...being so low in cost...being so satisfactory in service.
More Clay Pipe Used Day After Day
Not only has more Clay Pipe been used in the past, but more Clay Pipe is being used day after day, in city after city, in state after state in new construction work...carrying sewerage and drainage under municipal and factory buildings, under streets and highways, under railroads and airports and under housing projects and private homes.
Clay Pipe is universally used, because it never wears out. It will not decompose, corrode or rust. It resists acids, alkalies, wastes, gases and abrasion. That's why any sewer or drain constructed with Clay Pipe is an all-purpose installation. That's why Clay Pipe is the only guaranteed sewer or drain material.
For information concerning improvements in Clay Pipe to meet latest engineering practices, engineers are invited to write to:
C-1244-27C
NATIONAL CLAY PIPE MANUFACTURERS, INC.
111 W. WASHINGTON ST., CHICAGO 2, ILL.
IT WILL PAY TO USE CLAY
CLAY PIPE

PLANNING A SMALL PLANT?

If you are . . . or will be planning a small sewage-treatment plant . . . you will want to know, *in advance* . . . how your community can be *fully* protected by *complete* sewage treatment, comparable to the *best* in larger cities.

Get the facts by calling in a Rex Sanitation Engineer. There is no obligation. Plan with him. Let him show you the simplicity, economy and efficiency that Rex Sanitation Equipment makes possible in small sewage-treatment plants.

Here are a few of the many advantages offered by Rex:

The Rex "M.I." type mechanically cleaned Bar Screen is engineered specifically to give all the advantages in design and construction found in large plant units.

The Rex "M.I." Conveyor Sludge Collector and Skimmer reduces installation costs and maintains plant efficiency.

The Rex "M.I." Grit Collector is a simple, ruggedly constructed unit that assures low installation cost and high efficiency for the smaller plant.

The Rex Aero-Filter is an exclusive process that eliminates the need for excessive recirculation and oversize primary settling tanks. It materially reduces the size and operating cost of the plant.

Specially trained Rex sanitation engineers can help you with your problems. For complete information, write Chain Belt Company, 1610 West Bruce Street, Milwaukee 4, Wisconsin.

Blueprint Now!

Rex "M.I." mechanically cleaned Bar Screen and Rex Grit Collector.

Rex Aero-Filter permits much larger daily capacities with smaller filter bed.

Small primary settling tanks equipped with Rex "M.I." Conveyor Sludge Collectors.

REX **SANITATION EQUIPMENT**

Triturators • Bar Screens • Tow-Bro Sludge Removers • Slo-Mixers
Aero-Filters • Rapid Mixers • Grit and Sludge Collectors and Grit Washers

CHAIN BELT COMPANY OF MILWAUKEE

Member of the Water and Sewage Works Manufacturers Association, Inc.

through the courtesy of one E. L. (Blueprint Now) Filby, now Chairman of the Public Relations Comm. of AWWA. E. L. says, too, that there aren't any sewage stamps. Any of you other stamp collectors know whether or not he is right on that? Be glad to hear from you.

* * * *

This has nothing to do with sanitary engineering, water purification or sewage treatment, but it may interest you to know that with the advent of so much travel by soldiers and families, the mouse problem in railroad cars has become something to think about. Crumbs and scraps of sandwiches, candy, and the like, are the attraction and it is not uncommon for fumigated cars to yield twenty or more mice.

* * * *

Heard recently that Herb Moore of Wisconsin, now in Europe in the Sn. C., has seen Dr. Karl Imhoff in Shaundorf, Germany, just southwest of Munich, where he has been living since 1937. Herb says that Imhoff hopes to renew his association with many United States acquaintances. —Wonder how he and other sanitary engineers faired under the Nazi regime.—Wonder too, how they felt about that octopus.

* * * *

For a great many years we have all heard the water works men sell water softening on the basis that the saving in soap would pay for the softening. In fact, I was in graduate school with the fellow who wrote his doctor's thesis on that very topic. Now if some of these soapless soaps are as good as they say, the consumers won't care whether or not the water is hard—or will they?

* * * *

Harry Faber, who has been working on the problem of identifying colors for chlorine containers, says that when it comes to printing safety precautions, how about the fellow who can't read. Harry cites the story of one man who died and another who was hospitalized after drinking a clear liquid from a container adequately labeled "Toxic." The fellow who lived said they thought that meant *intoxicating*. Maybe we'd better refer that to Clint Bogert's Glossary Committee, Harry!

* * * *

Incidental Intelligence: The United States Cartridge Co. of St. Louis, Mo., used 5,320,475,750 gallons of water in three years and nine months of producing rifle and machine gun ammunition, according to Steve Hannegan, famous press agent. That was an average of three quarts per cartridge for nearly seven billion rounds. "Yup, thar shore wuz a passel a water used in that thar war."

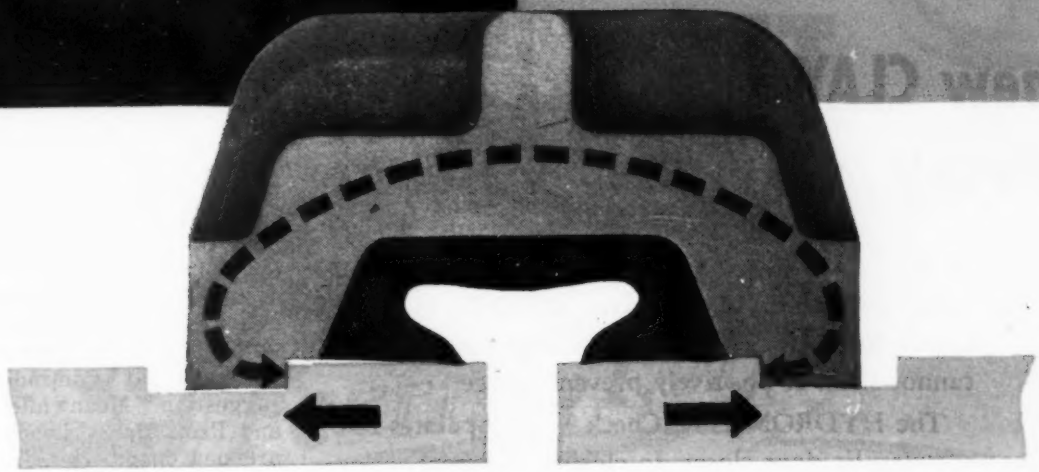
* * * *

Thumbnail Sketches. Bill Littlehales, for 35 years the water works superintendent at Dickinson, N. Dak. was born on Sept. 3, 1859, at Oquawka, Ill. on the banks of the Mississippi. Educated at Kirkwood and Galesburg, Ill. Bill learned the blacksmith's trade, the machinist's trade and steam engineering. In St. Louis he worked a 10 hr. day in the machine shop and ran the largest Corliss engine in the city at night.

Bill Littlehales is also a fireman and has belonged to some fire department almost continuously for 67 years, having been in Dickinson for the past 44, the last ten of which he has been the Chief. Bill is probably the oldest fire chief in the U.S. —This column which is indebted to the *O-B* of the North Dakota Water

NO COSTLY ANCHORAGE!

...WITH VICTAULIC COUPLINGS



VICTAULIC offers you a locked pipe joint that is positive—a preventer of pull-out or blow-off under pressure, vibration, or sag—the pipe coupling that requires *no anchorage!*

The Victaulic Coupling floats in the pipe-end grooves, permitting angular flexibility and longitudinal movement without strain. What's more, excessive bolt tension is unnecessary. This eliminates the danger of joint or pipe-end damage where tightness or grip depends largely on heavy bolt tension.

Victaulic is designed to operate under full rated pressure end loads—without the additional application of expensive anchorages—providing a strong, permanent, self-sufficient pipe joint that needs no nursing. It's the coupling that can do a job for you.

For details of the many additional operating advantages of the Victaulic Coupling, write for our new illustrated catalog and Engineering Manual . . . Address VICTAULIC COMPANY OF AMERICA, 30 Rockefeller Plaza, New York 20, N. Y. Other Victaulic offices —Victaulic Inc., 727 West 7th St., Los Angeles 14, California; Victaulic Co. of Canada, Ltd., 200 Bay St., Toronto.

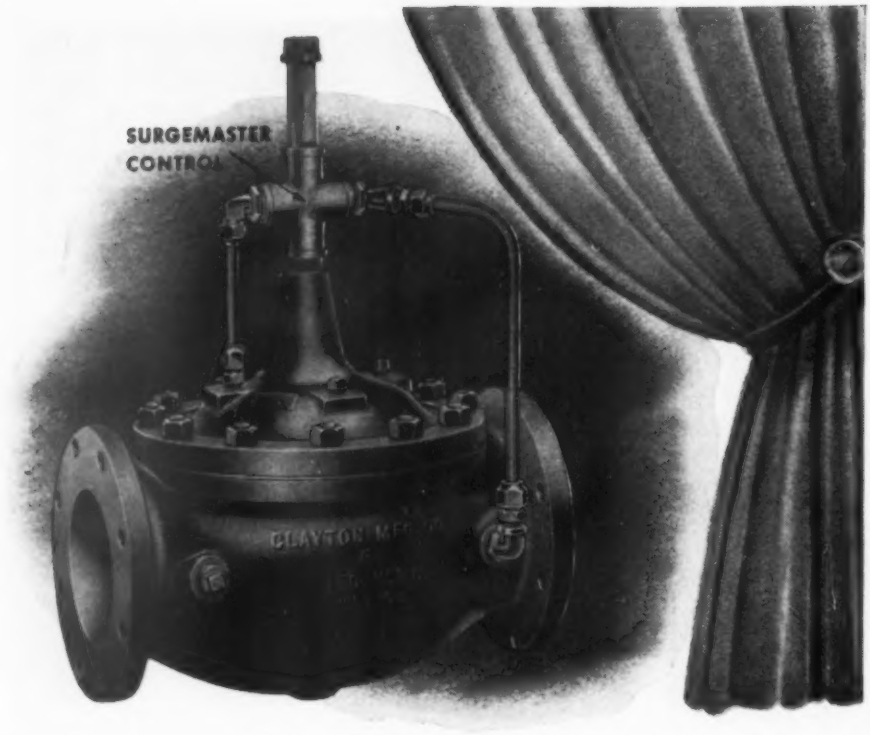
VICTAULIC

Reg. U. S. Pat. Off.

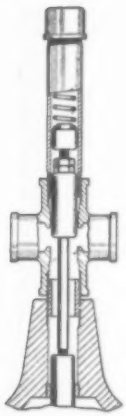
SELF-ALIGNING PIPE COUPLINGS AND FULL-FLOW FITTINGS

Copyright 1945 by Victaulic Co. of America

OIL MINING MARINE MUNICIPAL INDUSTRIAL



This new CLAYTON Check Valve positively prevents SURGE!



SURGEMASTER provides no-surge, no-slam control.

At last . . . the Check Valve that provides *controlled* surge protection. The Clayton HYDROMATIC Check Valve is entirely hydraulic in operation. It cannot slam. It positively prevents surge.

The HYDROMATIC Check Valve operates like a hydraulic door closer. In closing, the final action is throttled, thus effectively preventing surge. The opening operation is similarly controlled. Action in either direction starts by equalizing pressures gradually, without shock or water hammer.

Pressure to open and close the valve is directed through the SURGEMASTER Control which is adjustable to permit changing the speed of opening and closing to meet all conditions.

Write for Descriptive Bulletin • Representatives in Principal Cities

VALVE DIVISION
CLAYTON
"Feather Touch" CONTROL

CLAYTON MANUFACTURING COMPANY, ALHAMBRA, CALIFORNIA

and Sewage Conference for the above sketch, wonders if Bill Littlehales isn't also the oldest water works superintendent. — (I've always been interested in the oldtimers in this business and I'd be pleased to receive thumbnail sketch material on any candidates you readers may have).

* * * *

Read in *Chem. and Engr. News* that in recognition of service as Chief of the Quality of Water Division of the U. S. Geol. Survey, W. D. Collins was honored not long ago. Collins is active in the Water and Sewage Division of ACS, and a member of the Comm. of Std. Meth. of Water Anal.

* * * *

Pee Bees News: A letter signed by Mike Glace and addressed to some professor in N.Y., who apparently was coorganizer with Mike of the now famed Pee Bees or more correctly the $P_3B_3P_2$, makes a complaint. It is true, said Mr. Glace, that the organization was inaugurated with the expenditure of their time, their energy, and their money (contributed largely at informal sessions but nevertheless their money) and therefore I.M. Glace believes that the organizers have the right to voice opinions about who should and who should not become members of the Pee Bees.

Next meeting appears to be in Richmond at Comrade Churchill's suggestion. Meanwhile, C. F. Wertz and Prof. Harry Lendall (Rutgers) are new members. The letter also contained this postscript, "A copy of this letter is being sent to the Columnist to inform him as to who's who, and why. Too bad his qualifications for admission are so poor." Thanks Chum!

* * * *

About a year ago, I was talking to Don (Amer. Well Wks.) Walker and he told me that he goes through each issue of the *Official Patent Gazette* to see what's new in this business. I told Don there was no use of both of us doing that delightful chore, for each week I, too, thumb page by page through that book reading the titles and looking at the pictures of every patent issued, in hopes of finding some on water or sewage treatment.

That fellow who resigned from the Patent Office in the 1880's because there was nothing left to invent would be surprised to see some of the patents of today, which run from

Soft WATER CAN HELP SOLVE A *hard* PROBLEM MANY CITIES MUST FACE IN POSTWAR . . .

HOW to attract industry . . . how to make citizens happy and contented—this is the problem confronting municipal management now.

One thing sure to click, with industrialist and resident alike, is good city water—free of hardness, dirt and iron.

Permutit* Water Conditioning equipment removes the impurities found in all natural water supplies. It makes a city completely independent of local water conditions.

Write to The Permutit Company, Dept. K1, 330 West 42nd St., New York 18, N. Y., or Permutit Company of Canada, Ltd., Montreal. Get the facts about Permutit's economical equipment.

*Trademark Reg. U. S. Pat. Off.

PERMUTIT

WATER CONDITIONING HEADQUARTERS

ISCO *Ferri-Cl_3or*

FERRIC CHLORIDE

MODERN, EFFICIENT, MORE ECONOMICAL

Coagulant

FOR SEWAGE AND INDUSTRIAL WASTES

- Comparison with the performance of other commercial coagulants indicates that, weight for weight, Ferri-Cl_3or produces a better sludge floc for filtration . . . at definitely lower cost.
- Further details will be found in Water Works & Sewerage, June, 1945, Reference & Data Edition, page R-244.
- For *complete* information, write us.

INNIS, SPEIDEN & CO. Manufacturers,

117 LIBERTY STREET • NEW YORK 6

BOSTON CHICAGO CINCINNATI CLEVELAND GLOVERSVILLE PHILADELPHIA

how to "doctor" sick water

Contaminated water streams are deadly carriers of disease-spreading bacteria . . . *sick water* that endangers the health of soldiers on fighting fronts . . . and imperils the water supply and sewage disposal systems of our industrial areas.

Today, SOLVAY Liquid Chlorine safeguards the water supply of a nation and its fighters.

Tomorrow, it will serve municipalities and industries with the benefits of wartime discoveries.

SOLVAY SALES CORPORATION
Alkalies and Chemical Products Manufactured by The Solvay Process Company
40 Rector Street **New York 6, N. Y.**
BRANCH SALES OFFICES:
Boston • Charlotte • Chicago • Cincinnati
Cleveland • Detroit • New Orleans • New York
Philadelphia • Pittsburgh • St. Louis • Syracuse

SOLVAY
LIQUID CHLORINE

such homey things as water closets, fountain pens, tooth brushes, mop pails and uplift corsets, through back washers, welt producers and nibbling tools, to a Bingo counter, agioniometer, and 3-4 dihydroxyphenisopropyl alkylamines.

And how many patents are issued each week? Well, in one period of 12 weeks, there were 6,579 patents, of which only 32 pertained to water and sewage. See why we only run abstracts every two or three months, Don?

The other day I was rereading a letter from Jim Rumsey (The Old Maestro of Michigan) and came across this paragraph: "Again it is interesting to observe how much has been done with the byproducts of some industries and how little with others. I'm amazed how little waste oil is recovered or reconditioned for re-use or for fuel. Also surprised at the crudeness of design of most industrial waste treatment plants, no finesse, largely makeshift and, above all, the apparent honest conviction of industrialists to believe they have the God-given right above the individual in the use of streams."

Knowing Jim, I know that he is *not* being a carping critic, but is an honest observer. And what Jim observes is a need for education in the matter of industrial pollution, and a wonderful opportunity for sanitary engineers to design proper treatment works.

THE SPILLWAY

[Overflow from the main section]

Nat. Council for Stream Improvement Takes Over Waste Abatement Activities of Wisconsin Mills

The National Council for Stream Improvement (of the Pulp, Paper and Paperboard Industries), Inc., and the Sulphite Pulp Manufacturers' Committee on Waste Disposal of Wisconsin have completed an agreement whereby the national group will take over the Wisconsin group's activities in the pulp and paper mill waste disposal field. The Wisconsin group has been engaged for the past six years in research activities centered at The Institute of Paper Chemistry in Appleton, Wis., to determine means of disposing of waste sulphite liquors in a manner consistent with the public interest. Concurrently with its activities in the abatement field, the Wisconsin group, through its research group at the Institute, has carried on scientific investigation in connection with the utilization of chemicals and other valuable materials which, under current day practice, are generally discharged with the waste liquor.

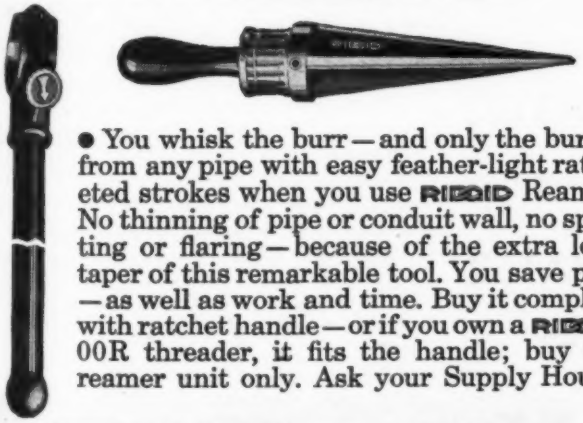
The work sponsored by the Wisconsin group has been carried on under the direction of J. M. Holderby, Coordinator, and more recently, during Mr. Holderby's absence in service in the Armed Forces, under A. J. Wiley. Cooperating in these activities were L. F. Warrick, State Sanitary Engineer of the State of Wisconsin Board of Health, and other personnel of the Board. The waste abatement activities which are being taken over by the national group will be carried on at The Institute of Paper Chemistry by the personnel employed by the Wisconsin group but will be under the supervision of the National Council for Stream Improvement, Inc., and financed by it.

The specific projects taken over from the Wisconsin group include the Trick-

FAST
EASY
Safe
PIPE REAMING

with this extra-long-taper

RIDGID



● You whisk the burr—and only the burr—from any pipe with easy feather-light ratcheted strokes when you use RIDGID Reamer. No thinning of pipe or conduit wall, no splitting or flaring—because of the extra long taper of this remarkable tool. You save pipe—as well as work and time. Buy it complete with ratchet handle—or if you own a RIDGID 00R threader, it fits the handle; buy the reamer unit only. Ask your Supply House.

RIDGID
WORK-SAVER PIPE TOOLS
THE RIDGE TOOL COMPANY · ELYRIA, OHIO, U. S. A.

Peerless presents the

Water King

PUMPING SYSTEM

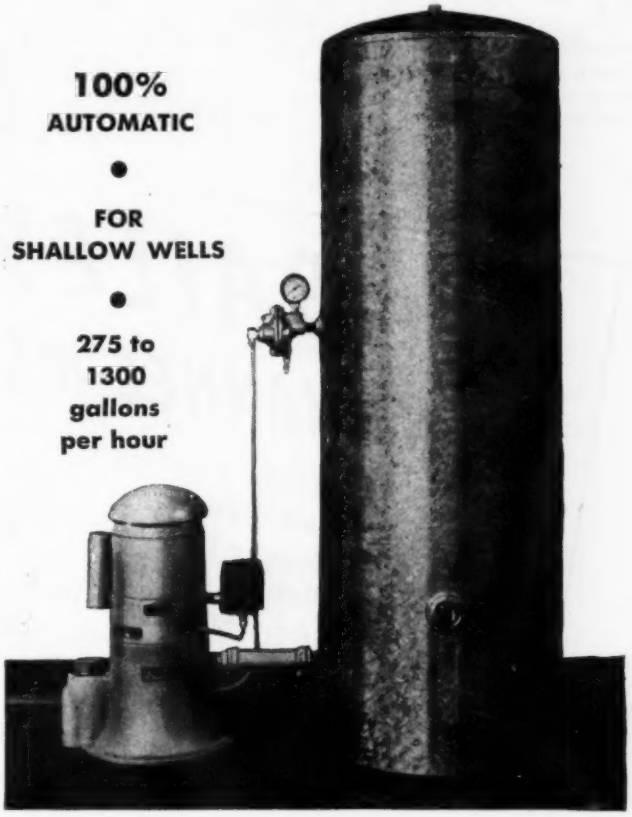
100% AUTOMATIC

●

FOR SHALLOW WELLS

●

275 to 1300 gallons per hour



Embodies magic intracentric water-lift

Applying a revolutionary water-lifting principle, with a magic pumping element intracentrically positioned within the pump case, Peerless presents the most advanced Pumping System—the *Water King*. The pumping element is the famous Peerless Hi-Lift, ingeniously applied in simplest form. Pressure maintained automatically. Silent, smooth, non-pulsating operation. Pump can be installed over-well or off-set. Heavy-duty, capacitor type motor. 1/6 to 3/4 h.p. No moving parts below surface. Water-lubricated. No sand cutting. Streamline design.

Peerless JET Water System

Improved design. For deep or shallow wells. Over-well or off-set. Capacities 300 to 5000 gallons per hour. 100% automatic.

Peerless Distributors and Direct Factory Representatives are located in every State. Ask for name of Distributor nearest you.

PEERLESS PUMPS

PEERLESS PUMP DIVISION
Food Machinery Corp.

FACTORIES
LOS ANGELES 31, CALIFORNIA · 301 West Avenue Twenty-six
QUINCY, ILL. • CANTON 6, OHIO

ling Filter and River Reaeration Projects. In the Trickling Filter process the liquor is treated and the biochemical oxygen demand is satisfied before the waste liquor passes into receiving waters. In the River Reaeration process the untreated waste liquor after dilution in a river is acted upon by the micro-organisms naturally present in river water. The deficiency in available oxygen is satisfied by diffusing large amounts of air into the river.

The Trickling Filter has been under experimental development for some six years, and has progressed from the laboratory stage to a 15-foot filter in operation at the Consolidated Water Power and Paper Company's mill at Appleton, Wis. River Reaeration is in actual operation at the Flambeau Paper Company at Park Falls, Wis.

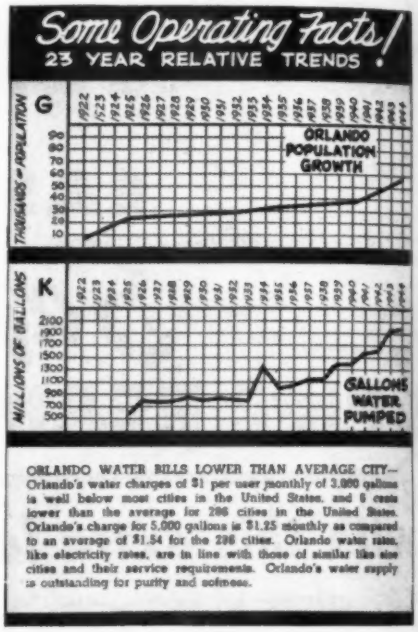
Back to Normal at NYU

Stepped-up wartime collegiate schedules that compressed four years' work into three will soon be a thing of the past. According to Dean Thorndike Saville of the New York University College of Engineering, N.Y.U. will be one of the first to mark the end of hostilities by returning to a normal schedule of two 16-week semesters a year.

A full year will be required before all students will be back on the normal schedule. From this October until July, 1946, most upper classmen will continue on the accelerated program while entering freshmen and lower classmen will be on the normal schedule.

Orlando Utilities Commission Reports

In an attractive 6-page folder (including the cover), the Orlando, Fla., Utilities Commission tells the story of the 1944 municipal utilities record, and quite a record it is, too. So cleverly is the report prepared that it requires but 2 pages of type and one page of graphs to show that Orlando's municipally owned and operated utilties in 1944 passed all former years' activity.


Some Operating Facts!
23 YEAR RELATIVE TRENDS
G
THOUSANDS OF POPULATION
ORLANDO POPULATION GROWTH
K
MILLIONS OF GALLONS
GALLONS WATER PUMPED
ORLANDO WATER BILLS LOWER THAN AVERAGE CITY—
Orlando's water charges of $1 per user monthly of 3,000 gallons is well below most cities in the United States, and 9 cents lower than the average for 286 cities in the United States. Orlando's charge for 5,000 gallons is $1.25 monthly as compared to an average of $1.34 for the 286 cities. Orlando water rates, like electricity rates, are in line with those of similar like size cities and their service requirements. Orlando's water supply is outstanding for purity and softness.

The whole story of the trend of 23 years of Operating Facts, and Where the Money Goes is shown in eleven easily readable graphs, each of which carries a one paragraph explanation.

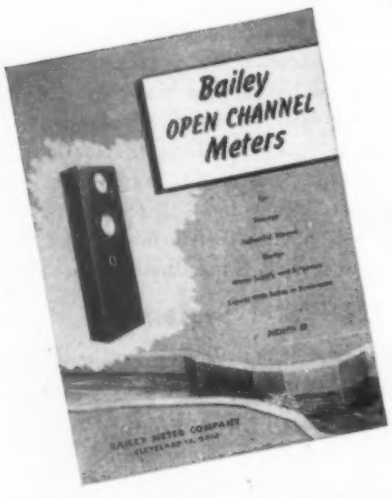
Growth of the city (and consumers), operating revenue, net income, plant valuation and total assets show a steady and healthy rise from 1923 to 1944, while the cost of power per KW to the consumer has shown a continued downward trend. Operating expenses have not increased as rapidly as production and consumption, indicating good management of operations.

Water consumption has gone from 2.33 mgd. in 1930 (85 gpcd.) to 5.34 mgd. in 1944 (97.2 gpcd.), This trend indicates a need for increased water supply capacity "for which adequate financial reserves have been wisely created." Orlando water bills are lower than the average for 286 cities being $1.00 per month for 3,000 gal. and $1.25 per month for 5,000 gallons.

THE BAILEY OPEN CHANNEL METER

1. Retains Accuracy
2. Self-Cleaning
3. Easy to Install
4. Easy to Maintain
5. Adjustable Capacity
6. Indicates, Records, Integrates
7. Totalizes Multiple Flows
8. Simple Chemical Feed Control
9. Rate of Flow and Ratio Control

A Reliable Low Cost Meter for



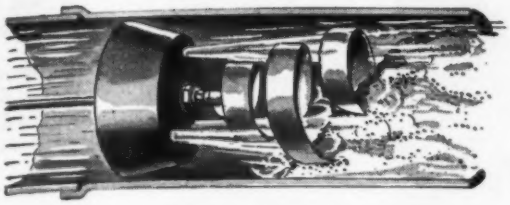
SEWAGE
INDUSTRIAL WASTES
SLUDGE
IRRIGATION WATER

Ask For Bulletin 62

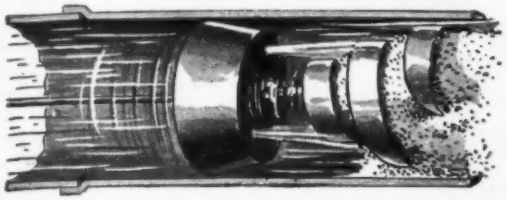
MU23

BAILEY METER COMPANY
1072 IVANHOE ROAD • CLEVELAND 10, OHIO
METERS and CONTROLS for SEWAGE and WATER
VENTURI TUBES, FLUMES, WEIRS, NOZZLES, ORIFICES • DIRECT MECHANICAL AND REMOTELY LOCATED REGISTERS • AIR-OPERATED, ELECTRONIC AND ELECTRIC CONTROLS.

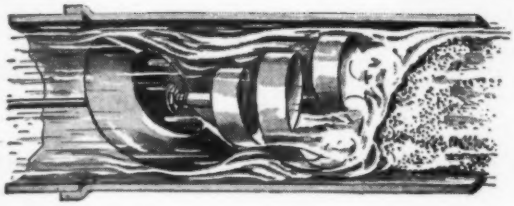
ROOTS



& SAND



MUST GO!



WHEN YOU USE . . .

FLEXIBLE'S sand cup and auger

IT'S NO TRICK to remove sand, gravel, mud, and rock from a pipeline quickly and easily with a Flexible Sand Cup and Auger. Standing at a manhole, two men can put to work the three actions illustrated above. Here's the way the Flexible Cup and Auger work:—

ACTION NO. 1 — **WATER JETS WASH AWAY SAND**
The head pressure of water in the manhole causes the water to jet through the holes in the Rubber Cup which washes away loose sand.

ACTION NO. 2 — **LIKE A CORKSCREW, IT BORES IN**
Powered by Flexible Rods, the auger bores in while the water spurts through holes. Line being cleaned must be partially free flowing because this method depends upon the head pressure to force the loose materials down the line.

ACTION NO. 3 — **RELEASING WATER PRESSURE**
A pull back collapses the cup and releases a greater volume of water when the water level in the manhole rises too fast. This also serves to wash the sand or obstructions faster.

Write for illustrated catalog showing the various types of Flexible equipment.

FLEXIBLE SEWER-ROD EQUIPMENT CO.

615 Pickwick Bldg., Kansas City 6, Mo.
1624 Harmon Place, Minneapolis 3, Minn.
P.O. Box 165, Atlanta
P.O. Box 694, Gulfport, Miss.
41 Greenway St., Hamden, Conn.

9059 Venice Boulevard
Los Angeles 34, California

2645 E. 75th St., Chicago 49
147 Hillside Terrace, Irvington, N. J.
P.O. Box 694, Pittsburgh
401 Broadway, New York 13
29 Cordon Ave., Reading 31, Mass.

+ Plus Chlorine
− Minus Taste and Odor

PUT chlorine in to take taste and odor out. Chlorine, the standard treatment for water sterilization, is giving plus value to water supply by its ability to remove objectionable tastes and odors.

Superchlorination with later dechlorination . . . chlorine in conjunction with ammonia to form chloramine . . . continuous chlorination of entering water. These are some of the ways chlorine is being used to eliminate tastes and odors depending upon their cause.

There may be a choice about the method that will give you best results, but for the chlorine to use, there is no question. Hooker has been providing high quality, high purity liquid chlorine to water works, filtration plants and sewage systems for many years. Hooker's technical staff, continuously working with chlorine, has accumulated a fund of specialized knowledge that is available to you for help in overcoming and solving problems in handling chlorine. Call on them whenever you need information or assistance.

HOOKER ELECTROCHEMICAL COMPANY

Buffalo Ave. and Ward St. Niagara Falls, New York

New York, N. Y.
Tacoma, Wash.
Wilmington, Calif.

HOOKER CHEMICALS

Chlorine **Caustic Soda**
Ferric Chloride **Bleaching Powder** 8512

The Inside
Comes Outside
For inspection or repair (and that is rarely necessary) the inside of a MATHEWS Hydrant comes outside. That is, the barrel, containing all working-parts, can be taken out, and a spare barrel put in . . . all in a few minutes. Result: Little time is lost; life and property are safeguarded better; the pavement is not broken; maintenance is simplified. MATHEWS have been standard over the world for more than 60 years. Because compression-type, they can't leak when broken; because of complete drainage, they can't freeze. The nozzles can be raised or lowered *without excavation;* they can be turned any direction of the compass. It's no wonder there are some 400,000 in use today.
MATHEWS HYDRANTS
Made by R. D. WOOD Company
PUBLIC LEDGER BUILDING
INDEPENDENCE SQUARE, PHILADELPHIA 5, PA.
MANUFACTURERS OF SAND SPUN PIPE (CENTRIFUGALLY CAST IN SAND MOLDS) AND R. D. WOOD GATE VALVES

Martin W. Brown is General Manager of the Orlando Utilities Commission which received the National Securities Award of the U. S. Office of Civilian Defense for its work during the war. This is another instance of recognition of the Water Works field so richly deserved by all water plants, and this report is good evidence of why the award was made.

Ill. State Water Survey 50th Anniversary

In the past five decades since the Illinois State Water Survey was instituted at the University of Illinois, in Urbana, there has been a very large number of samples of waters of that state examined and reported on. There have been a sizable number of students, too, who have studied and worked on that staff in the last fifty years. In fact there are a host of men who have been associated with Dr. A. M. Buswell who, this year, celebrates his twenty-fifth year as Chief, as well as many others who worked with Dr. Bartow prior to 1920.

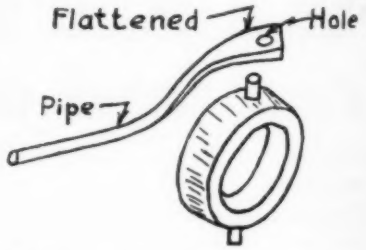
Started in 1895 by Prof. Palmer as part of the Chemistry Dept., the Survey undertook to study water supplies and prevent typhoid epidemics, then a recurring threat to public health. In 1911 the Water Survey became a separate entity with funds from the State Legislature. In 1914 Dr. Edward Bartow, then Chief, began the studies on sewage treatment, and it was there that many of the early studies on activated sludge were carried on.

State Administration reorganization in 1917 transferred the Water Survey to the Dept. of Registration and Education, but it has remained housed in the Noyes Laboratory of the University. Now a new separate building is planned for the organization, which consists of 30 staff members.

Not only have the ground and surface waters of the state been studied but research has been carried on on sewage treatment, sludge digestion, methane fermentations, water softening, colloid and physical chemistry in water and sewage treatment, as well as many other phases of the subject. Not all of the men who have been members of that staff are still in the field of sanitary engineering chemistry but there are a goodly number of names of outstanding men in the field who once were staff members of the Illinois State Water Survey.

An Emergency Spanner Wrench

Should you lose your regular spanner wrench and should you need one in a hurry, a good practical wrench can be made out of ordinary iron pipe as indicated in the accompanying sketch.



Flatten one end of the pipe, as shown, drill a hole of correct bore through the flat, also as indicated, bend the "handle" to proper fitting shape, cut the pipe to the length you want, and you are "all set."

(Contributed by W. F. Schaphorst, Newark, N. J.)

O.P.A. Exempts Mutual Water Rates

Rates of non-profit mutual water companies for the sale of water service to their members were exempted from price control by the Office of Price Administration, effective Sept. 24.

According to the OPA, these sales were exempted because these companies generally have the power of assessing their members for any deficits in operating income, and there is little incentive to increase rates except as necessary to meet expenses. In addi-

It's *Your* Turn Now...

YOU'VE had to wait a long time but knowing what whiskered gent was closeted behind the closed door of the inner office, you have waited patiently and good-naturedly.

Busy as we were with Uncle Sam's urgent business, we were thinking about you and doing all we could to fill *your* orders. Then too, when anybody had a minute to spare he was planning and scheming to cut the time necessary to shift from war production to your production. As a result, we think we've set some kind of a record in reconversion. We had our machines all ready for the switch at a minute's notice. We had the crew all picked and set for the job. We took advantage of layoffs in other plants to *increase* our force.

Yes, we're cutting deep and fast into that stack of unfilled orders. And with our greatly increased production capacity, we're going to continue pulling them from the bottom as fast as you can pile them on top.

SEVENTY-SIX YEARS DEPENDABLE SERVICE

HAYS

COPPER · BRASS · LEAD · IRON

WATER WORKS PRODUCTS

HAYS MANUFACTURING CO., ERIE, PA.

ARMY E NAVY

Announcement—

SPARTANBURG

ESTABLISHED AS BASE DISTRIBUTING POINT FOR

LIQUID CHLORINE

We wish to announce the completion of facilities for filling 100-lb. and 150-lb. cylinders from single-unit tank cars with Liquid Chlorine, as manufactured by the Columbia Chemicals Division of Pittsburgh Plate Glass Co.

This new installation was erected for the specific purpose of rendering better service to Chlorine consumers in the Piedmont area.

This makes available for the first time adequate supplies of Liquid Chlorine from Spartanburg in equipment regularly inspected, meeting ICC specifications.

Inquiries concerning your requirements will be appreciated and handled promptly.

Moreland CHEMICAL CO. Inc.

314 W. HENRY ST. SPARTANBURG, S. C.

Manufacturers and Distributors

INDUSTRIAL CHEMICALS

STATEMENT OF THE OWNERSHIP, MANAGEMENT, CIRCULATION, ETC., REQUIRED BY THE ACTS OF CONGRESS OF AUGUST 24, 1912, AND MARCH 3, 1933

Of Water Works & Sewerage, published monthly at Chicago, Ill., for Oct. 1, 1945.

State of Illinois, County of Cook, ss.

Before me, a Notary Public in and for the State and county aforesaid, personally appeared Edward S. Gillette, who, having been duly sworn according to law, deposes and says that he is the publisher of the Water Works & Sewerage and that the following is, to the best of his knowledge and belief, a true statement of the ownership, management (and if a daily paper, the circulation), etc., of the aforesaid publication for the date shown in the above caption, required by the Act of August 24, 1912, as amended by the Act of March 3, 1933, embodied in section 537, Postal Laws and Regulations, printed on the reverse of this form, to-wit:

1. That the names and addresses of the publisher, editor, managing editor, and business managers are:

Publisher—Edward S. Gillette, 330 S. Wells St., Chicago 6, Ill.

Editor—L. H. Enslow, 155 E. 44th St., New York 17, N. Y.

Managing Editor—John Cecil Black, 330 S. Wells St., Chicago 6, Ill.

2. That the owner is: (If owned by a corporation, its name and address must be stated and also immediately thereunder the names and addresses of stockholders owning or holding one per cent or more of total amount of stock. If not owned by a corporation, the names and addresses of the individual owners must be given. If owned by a firm, company, or other unincorporated concern, its name and address, as well as those of each individual member, must be given.)

Gillette Publishing Company, 330 S. Wells St., Chicago 6, Ill.

Edward S. Gillette, 330 S. Wells St., Chicago 6, Ill.

L. H. Enslow, 155 E. 44th St., New York 17, N. Y.

H. P. Gillette, 330 S. Wells St., Chicago 6, Ill.

Winifred Gillette, 1125 Oak Grove Ave., San Marino, Calif.

Mrs. R. W. Hume, 303 S. Stone Ave., La Grange, Ill.

Louise E. Forsythe, 410 Thayer Rd., Swarthmore, Pa.

Provident Trust Company, 17th and Chestnut Sts., Philadelphia, Pa.

3. That the known bondholders, mortgagees, and other security holders owning or holding 1 per cent or more of total amount of bonds, mortgages, or other securities are: (If there are none, so state.)

4. That the two paragraphs next above, giving the names of the owners, stockholders, and security holders, if any, contain not only the list of stockholders and security holders as they appear upon the books of the company but also, in cases where the stockholder or security holder appears upon the books of the company as trustee or in any other fiduciary relation, the name of the person or corporation for whom such trustee is acting, is given; also that the said two paragraphs contain statements embracing affiant's full knowledge and belief as to the circumstances and conditions under which stockholders and security holders who do not appear upon the books of the company as trustees, hold stock and securities in a capacity other than that of a bona fide owner; and this affiant has no reason to believe that any other person, association, or corporation has any interest direct or indirect in the said stock, bonds, or other securities than as so stated by him.

5. That the average number of copies of each issue of this publication sold or distributed, through the mails or otherwise, to paid subscribers during the twelve months preceding the date shown above is—. (This information is required from daily publications only.)

EDWARD S. GILLETTE,
Publisher.

Sworn to and subscribed before me this 25th day of September, 1945.

(Seal) KITTIE C. WOULFE,
Notary Public.

(My commission expires February 7th, 1946.)

CARTER ALTERNATING SIPHONS

Typical installation photo of Carter alternating siphon unit.

Mr. Sanitary Engineer:

For almost four years you have been preparing for that avalanche of post-war public works construction. Now that peace has come, your blueprints will soon take shape as health monuments to safeguard your customer's communities. You'll want the finest in mechanical equipment. We suggest you investigate the economy and efficiency of CARTER automatic alternating siphons for sand filter bed secondary treatment.

***Write for Bulletin 4312.**

REPRESENTATIVE INSTALLATIONS

Pearl River, N. Y.
Loch Sheldrake, N. Y.
Lake Denmark, N. J.
State Training School, Conn.
Fort Monmouth, N. J.
Picatinny Aarsenal, N. J.
Eclipse Aviation Div., N. Y.
Elmira Heights, N. Y.

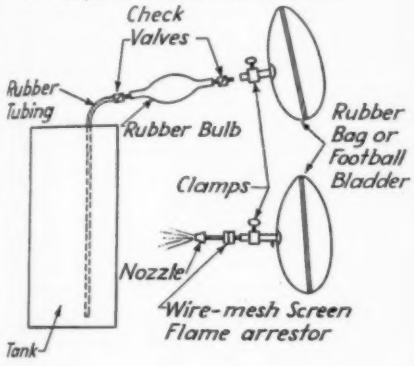
RALPH B. CARTER CO. HACKENSACK, NEW JERSEY
53 PARK PL., NEW YORK 7, N. Y.

tion, the OPA said that the administrative work load involved in continued control is disproportionate to the contribution to stabilization.

Testing Tanks for Inflammable Air-Gas Mixtures

From "Oxy-Acetylene Tips" comes the following suggestion of how to test the contents of a tank or enclosed space for the presence of explosive or inflammable gases when there is no suitable gas detector available. It is often essential that the air or air-gas mixture inside of containers, rooms, or tanks, be tested before repairmen enter. If a portable gas detector is not available a gas sampler such as shown in the cut may be used. Essentially it consists of a small rubber bag, which is filled with

Apparatus for Obtaining and Testing Samples of Flammable or Explosive Gases.



gas from inside the container, then taken to a safe place, and an attempt made to burn the gas as it is forced from the rubber bag and through a flame arrester. If the gas does not ignite or flash back, the container may be considered as safe for welding or cutting operations.

To Operate Gas Sampler

1. Take and test separately several samples from different levels of the container.

2. Squeeze and release the bulb several times before attaching the bladder to displace all air in the tubing and bulb with gas from the container.

3. Completely deflate the bladder and connect it to the free end of the bulb.

4. Operate the bulb to fill the bladder to a pressure sufficient for testing the gas.

5. Seal the bladder from the rest of the apparatus with the clamp and disconnect it from the bulb.

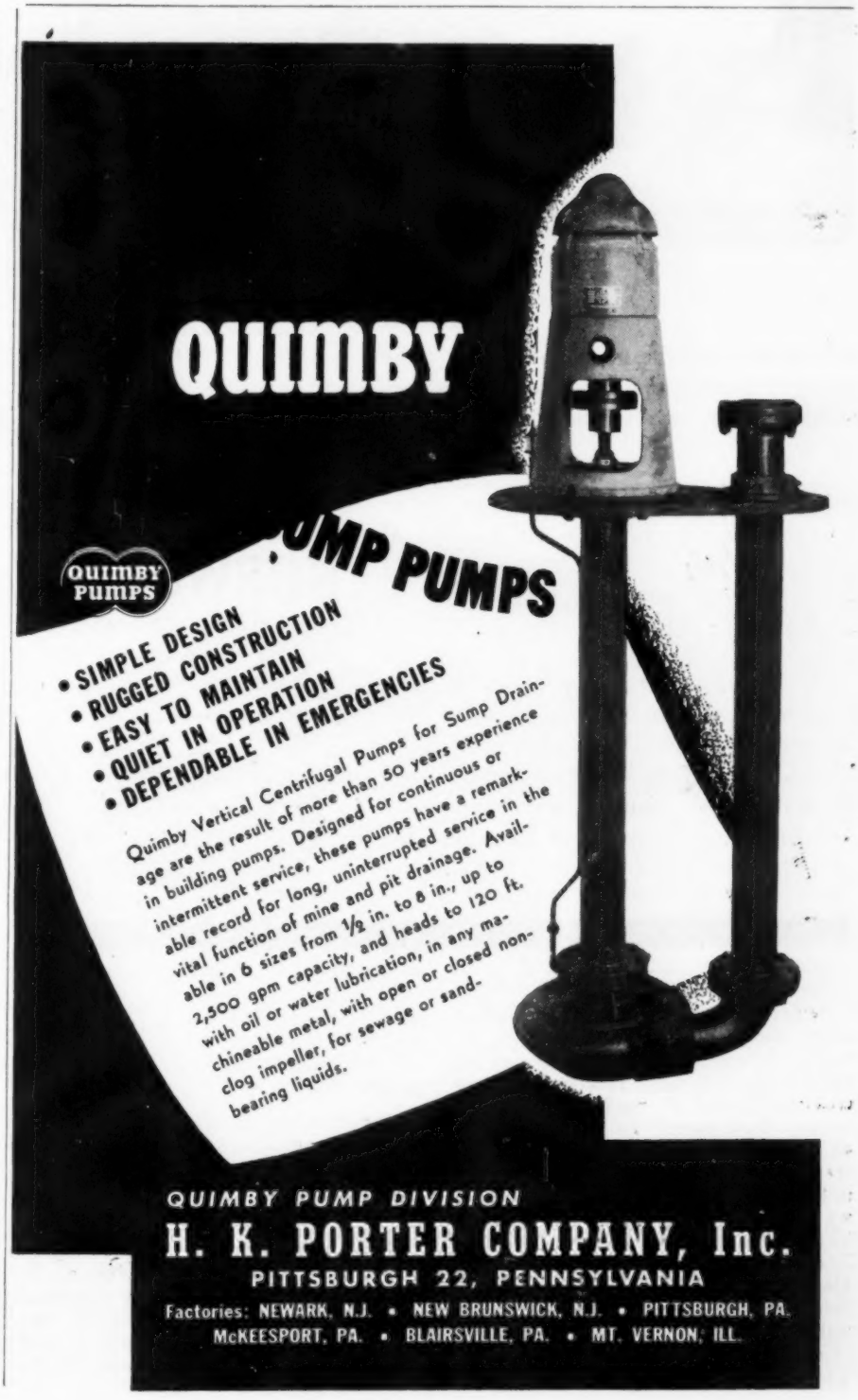
6. Connect the nozzle and flame arrester to the bladder.

7. At a safe distance from the container, apply a flame to the tip of the nozzle, and release the clamp. If the gas tends to ignite or flash back there is a flammable or explosive mixture in the container.

Report on Potomac River Basin

In a 61-page booklet, just released by the Interstate Commission on the Potomac River Basin, a summarized report of the Commission has been presented. Titled, "A Report on the Conditions Existing in the Potomac River Basin," this booklet contains information and material on the formation and work of the Commission itself, the history of the Potomac Basin, the description of the Basin and its resources and facilities.

Over one and one-third million persons, three-fourths of whom live in Washington, D. C., depend on the Potomac River or its tributaries for water supply. The average daily consumption for both domestic and industrial purposes is approximately 600 mgd.


QUIMBY
QUIMBY PUMPS
• SIMPLE DESIGN
• RUGGED CONSTRUCTION
• EASY TO MAINTAIN
• QUIET IN OPERATION
• DEPENDABLE IN EMERGENCIES
Quimby Vertical Centrifugal Pumps for Sump Drainage are the result of more than 50 years experience in building pumps. Designed for continuous or intermittent service, these pumps have a remarkable record for long, uninterrupted service in the vital function of mine and pit drainage. Available in 6 sizes from 1½ in. to 8 in., up to 2,500 gpm capacity, and heads to 120 ft. with oil or water lubrication, in any machineable metal, with open or closed non-clog impeller, for sewage or sand-bearing liquids.
QUIMBY PUMP DIVISION
H. K. PORTER COMPANY, Inc.
PITTSBURGH 22, PENNSYLVANIA
Factories: NEWARK, N.J. • NEW BRUNSWICK, N.J. • PITTSBURGH, PA.
McKEESPORT, PA. • BLAIRSVILLE, PA. • MT. VERNON, ILL.

Chemical Feeder equipment, part of the Norwood Filter System at Municipal Water Plant, Plattsburg, N. Y.

As important as the filters themselves is the chemical feeding equipment used to correct water content for many industrial or municipal plants.

Norwood engineers consider each project as a whole—from the time the initial sample of unprocessed water arrives at the laboratory until the finished installation is turning out the proper volume of corrected water.

The filters, the coagulation basin, the backwash system, the aeration and chemical feeding, the pumps and valves—are included in the Norwood plan for complete water treatment for any purpose. Your inquiries are invited.

W-4

The NORWOOD
ENGINEERING COMPANY
25 N. Maple St.
Florence, Mass.

The Best For Your Money
NORWOOD FILTERS
In The Long Run

Sewage discharged from the urban areas amounts to approximately 190 mgd. of which 20 mgd. receives no treatment, 153 mgd. receives primary treatment, and 17 mgd. receives secondary treatment. In addition, some 48 industrial plants discharge partially treated waste, and 50 others discharge untreated waste. These industrial wastes of some 50 mgd. have a population equivalent of nearly half a million persons. This added to an equivalent sewage discharge of one million brings the total waste load up to 1½ million persons.

Acid mine drainage and silt likewise add a load to the Basin. The former is estimated at 172,800 lbs. of acid per day and the latter at an average of 196,000 cu. yds. annually in the navigation channel alone.

The booklet considers the effects of pollution, problem areas, erosion, mosquito control, water chestnuts, desirable municipal improvements, and financial condition of municipalities.

"It is the Commission's intention to consider carefully all of the factors involved, and to plan and promote through established state agencies that program for pollution control and abatement which will be an asset to the Potomac Basin as a whole."

More W. & S. Wks. Projects

Additional Federal Loans for Construction Plans

In our August issue were listed some 61 communities (77 projects) in 21 states that had received loans from the Federal government for the preparation of plans for water and sewage works facilities. In the September issue were listed an additional 100 communities (122 projects) in 27 states and in the months of September and October the Federal Works Agency announced loans for the same purpose to 165 communities (206 projects) in 35 states.

These funds are made available through the Bureau of Community Facilities of the Federal Works Agency and are to be repaid when construction is begun.

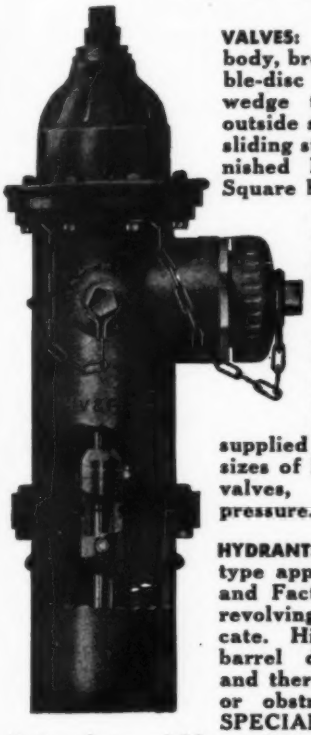
Both consulting engineers and equipment manufacturers should be interested to see the growing list of communities and projects that is further evidence of the effectiveness of the Blueprint Now program of the Committee on Water and Sewage Works Development. The entry of R.F.C. into the loaning of money for the construction of water and sewage works facilities bids fair to insure the actual construction of many of these projects.

The most recent recipients of the funds for planning are shown in the list below, together with the estimated cost of the completed project. (Several of the communities have received loans for other projects as shown in the previous lists.)

Community and Facility	Estimated Cost
Alabama:	
Alexander City (water)	$ 400,000
Auburn (sewage)	55,000
Gadsen (sewage)	227,915
Geneva (water)	125,000
Geneva (sewage)	86,000
Homewood (sewage)	334,800
Lipscomb (sewage)	112,156
Mobile (water)	2,843,646
Mountain Brook (sewage)	145,544
Prichard (sewage)	96,994
Sylacaupe (water)	172,372
Alaska:	
Town of Wrangell (water)	84,000
Town of Wrangell (sewage)	35,000
Arizona:	
Holbrook (sewage)	35,000
Holbrook (water)	28,000
Safford (water)	81,100
Winslow (sewage)	91,000
Arkansas:	
Earle (sewage)	84,650
Lincoln (sewage)	22,472
Van Buren (sewage)	28,518
Van Buren (sewage)	17,485
California:	
Berkeley (sewage)	70,000
Berkeley (sewage)	90,000
Cayucos San. Dist. (sewage)	152,000
El Cajon (sewage)	66,300
El Monte (sewage)	77,250
Martinez (sewage)	300,000
San Luis Obispo Co. (sewage)	152,907
Santa Ana (sewage)	280,000
Santa Monica (sewage)	90,000
Santa Monica (sewage)	194,000
Santa Monica (sewage)	91,933
Santa Monica (sewage)	13,200
Santa Monica (water)	475,000
Connecticut:	
New London (sewage)	210,586

Dependable!
Rugged!

VALVES
HYDRANTS



VALVES: A.W.W.A. type, iron body, bronze mounted with double-disc parallel seat or solid wedge type. Non-rising stem, outside screw and yoke, or with sliding stem and lever. Also furnished hydraulically operated. Square bottom type operates in any position. All rugged and dependable, made of best material with highest quality workmanship.

Hydraulically Operated: For remote control of operation and for quicker, easier opening or closing. Can be supplied in any of the standard sizes of M & H A.W.W.A. gate valves, either high or low pressure.

HYDRANTS: Standard A.W.W.A. type approved by Underwriters and Factory Mutuals. Dry top, revolving head, easy to lubricate. High efficiency because barrel diameter not reduced and there are no working parts or obstructions in waterway. SPECIAL TRAFFIC MODEL is designed to yield at ground line under impact, repair being simply renewal of breakable bolts and breakable coupling on stem.

Write for Catalog No. 34

M & H PRODUCTS INCLUDE

FIRE HYDRANTS	SHEAR GATES
GATE VALVES	MUD VALVES
TAPPING VALVES	VALVE BOXES
WALL CASTINGS	FLAP VALVES
SPECIAL CASTINGS	SLUDGE SHOES
TAPPING SLEEVES	FLANGE AND FLARE FITTINGS
CHECK VALVES	FLANGED FITTINGS
FLOOR STANDS	B & S FITTINGS
EXTENSION STEMS	CUTTING-IN TEES

M & H VALVE
AND FITTINGS COMPANY
ANNISTON, ALABAMA

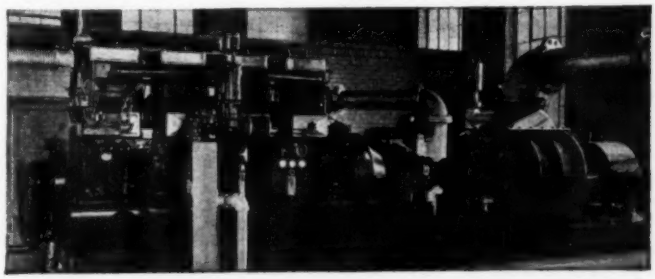
Specify POTTSTOWN

AIR BLOWERS for Sludge Aeration

To prevent clogging of diffusers, avoid blowers that require internal lubrication. POTTSTOWN Rotary Blowers are extensively used in sewage plants because they require no internal lubrication—cannot contaminate the clean air pumped to your filters or diffusers.

Inasmuch as the two impellers in these positive displacement POTTSTOWN Blowers do not touch each other, nor even the casing wall interior, there is *no surface friction*—no need for internal lubrication. No wearing parts here, so your operating and maintenance *costs are DOWN—with POTTSTOWN!*

Pottstown Rotary Blower with Sludge Gas Engine drive. Also available with Electric Motor, Belt, Steam Turbine, and Diesel Engine drives.



GAS EXHAUSTERS for Sludge Digestion

To prevent explosions of sludge gas, avoid its accumulation and possible mixture with air under digestion tank-tops. POTTSTOWN EXHAUSTERS syphon the sludge gas from your tank-top domes and safely compress it for storage tanks or direct combustion uses.

Because of the dangerous nature of sludge gases, the *absence* of static or surface friction in the impeller action of POTTSTOWN EXHAUSTERS provide the safest method of handling. And with substantial economies possible in the use of sludge gas (600 to 700 lb. t.u.) as a source of heat or power —your operating *costs are DOWN—with POTTSTOWN!*

WRITE TODAY for our new Bulletin No. P-100

ALLEN BILLMYRE COMPANY
449 Fayette Ave. Mamaroneck, N. Y.

POTTSTOWN
ROTARY POSITIVE DISPLACEMENT
BLOWERS AND EXHAUSTERS

DO YOU HAVE A *Tank problem?*

If you do we have the facilities to supply the answers regarding

★ **Tank Design**

An engineering department with experience and capabilities to tackle any practical size or shape, high or low-pressure tank, or special processing equipment.

★ **Tank Fabrication**

A factory capable of fabricating six million pounds of materials per month. Equipment includes the most modern forging, welding, shearing, punching and riveting equipment.

★ **Tank Erection**

Many unusual cost-reducing kinds of equipment specially designed by Stacey Brothers. We have erected thousands of tanks with capacities ranging up to ten million cubic feet.

A Stacey Brothers 1,500,000 cubic foot Dry Seal Gas Holder.

★ **Special Structures and Products**

We design, produce and install literally hundreds of different kinds of special structures and products of aluminum, steel and steel alloys.

Stacey Brothers Gas Construction Co.
One of the Dresser Industries
5535 Vine Street Cincinnati, Ohio

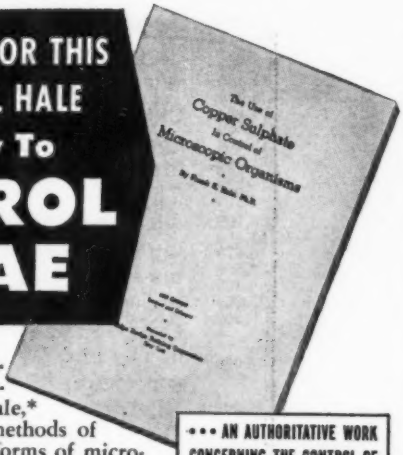
A Stacey Brothers vertical high-pressure tank.

Stacey Brothers TANKS

Community and Facility	Estimated Cost
Florida:	
Daytona Beach (sewage)	1,270,000
Daytona Beach (water)	196,400
Gainesville (water)	147,500
Tarpon Springs (sewage)	309,216
Venice (water)	100,000
Georgia:	
Albany (sewage)	318,000
Blakely (sewage)	49,700
Blakely (water)	25,300
Bowman (sewage)	38,500
Brunswick (sewage)	214,300
Camilla (water)	46,350
Camilla (sewage)	158,460
Clayton (sewage)	96,000
Clayton (water)	210,000
Donalsonville (water)	35,634
Donalsonville (sewage)	93,445
Gray (sewage)	50,000
Hampton (sewage)	73,000
La Grange (water)	612,850
Town of Gray (water)	72,765
Illinois:	
Bensonville (sewage)	66,000
Creve Coeur (sewage)	422,000
Des Plaines (water)	259,200
Dowell (water)	90,000
Gibson City (water)	70,000
Harvey (sewage)	1,083,000
Hillsboro (water)	26,700
Hillsboro (sewage)	34,220
Knoxville (sewage)	150,000
Macomb (water)	196,780
Madison County (sewage)	233,000
Odin (water)	15,000
Quincy (sewage)	220,000
West Frankfort (sewage)	264,280
Indiana:	
Michigan City (sewage)	294,700
Middlebury (sewage)	117,850
Mishawaka (sewage)	206,382
Tell City (sewage)	224,500
Iowa:	
Carter Lake (sewage)	92,000
Mitchelville (sewage)	77,911
Sac City (water)	83,000
Kansas:	
Hoisington (sewage)	115,100
Oakley (sewage)	34,380
Kentucky:	
Hazard (sewage)	116,000
Hazard (water)	152,700
Madisonville (sewage)	182,317
Louisiana:	
East Baton Rouge (sewage)	485,810
East Baton Rouge (sewage)	79,465
East Baton Rouge (sewage)	81,114
Olla (sewage)	68,450
Ponchatoula (sewage)	88,400
Ponchatoula (water)	64,921
Town of Carenco (water)	69,640
Town of De Quincy (sewage)	68,900
Town of Le Compte (sewage)	68,849
Town of Ville (sewage)	115,647
Ville Platte (sewage)	124,656
Maryland:	
Sharpsburg (water)	65,000
Massachusetts:	
Chicopee (sewage)	170,792
Franklin (sewage)	59,000
Franklin (sewage)	96,000
Leonminister (water)	455,000
Taunton (sewage)	488,000
Town of Méndon (water)	154,000
Town of Wenham (water)	337,780
Michigan:	
Beecher Metropolitan District (water)	55,650
Beulah (sewage)	59,837
Imlay City (sewage)	71,000
Iron Mountain (sewage)	267,000
Lansing Township (water)	168,000
Lansing Township (sewage)	60,000
Lincoln Park (sewage)	512,000
Muskegon (water)	987,000
Muskegon Heights (sewage)	350,000
Muskegon Township (sewage and water)	55,000
North Muskegon (water)	77,000
Rogers City (sewage)	309,000
Wayne County (sewage)	560,000
Minnesota:	
Alvarado (water)	14,000
Alvarado (sewage)	9,000
Alvarado (sewage)	12,000
Crookston (sewage)	305,975
Plummer (sewage)	64,365
Plummer (water)	49,140
Preston (sewage)	43,000
Preston (sewage)	22,800
Mississippi:	
Baldwyn (sewage)	97,500
Biloxi (sewage)	118,800
Forest (water)	35,000
Forest (sewage)	45,000
Kilmicheal (water)	33,000
Laurel (sewage)	94,466
Moss Point (sewage)	225,840
Pelahatchie (sewage)	16,750
Philadelphia (sewage)	229,610
Quitman (water)	34,977
Town of Glouster (sewage)	130,646
Town of Liberty (sewage)	67,160
Missouri:	
Bowling Green (water)	88,823
Blue Springs (sewage)	60,000
Cabool (sewage)	38,750
Columbia (sewage)	80,000
Clayton (sewage)	38,750
Haytl (water)	71,650
Ironton (sewage)	105,250
Olivette (sewage)	79,200
Ozark (sewage)	71,000
St. Louis County (sewage)	73,141
University City (sewage)	84,500
Montana:	
Fairfield (sewage)	80,000
New Hampshire:	
Portsmouth (sewage)	179,790
New Jersey:	
Camden (sewage)	4,013,030
Linden (sewage)	1,030,000
North Jersey Water District (water)	2,620,000
Perth Amboy (sewage)	300,000
Ohio:	
Cuyahoga County (sewage)	55,668
Tiffin (sewage)	677,000
Warren (sewage)	184,400
Warren (sewage)	211,000
Oklahoma:	
Ada (sewage)	27,400
Ada (sewage)	253,160
Chickasha (sewage)	150,000
Claremore (sewage)	128,380
Drumright (sewage)	12,598
Drumright (sewage)	51,129
Enid (water)	620,268
Muskogee (sewage)	632,000
Oklahoma City (sewage)	1,077,141
Town of Boley (sewage)	74,400
Town of Talihina (sewage)	44,300
Tulsa (water)	520,000

FREE WRITE FOR THIS BOOK BY DR. HALE Tells How To

CONTROL ALGAE



This revised and enlarged edition, written by Dr. Frank E. Hale,* describes in detail methods of controlling various forms of microscopic life commonly dealt with in water supply systems. Descriptive material includes 48 clear photomicrograph studies of organisms discussed. Simplified methods of applying copper sulphate are also shown. ... Many of the most important water works specify Nichols *Triangle Brand* Copper Sulphate. Triangle Brand is available in several convenient sizes for water treatment. Write *today* for details and book.

*(Director of Laboratories, Dept. of Water Supply, City of New York

••• AN AUTHORITATIVE WORK CONCERNING THE CONTROL OF MICRO-ORGANISMS AND ELIMINATION OF TASTES AND ODORS

FOR YOUR REQUIREMENTS SPECIFY

NICHOLS TRIANGLE BRAND COPPER SULPHATE 99% + PURE

THE STANDARD FOR OVER 50 YEARS

MADE BY
PHELPS DODGE REFINING CORPORATION
Electrolytic Refiners of Copper
40 WALL STREET, NEW YORK 5, N. Y. • 230 N. MICHIGAN AVE., CHICAGO 1, ILL.

LESS COST and MORE SPEED

FOR RUNNING WATER OR SEWER LATERALS

Just watch a Hydrauger operation once and you will know why it is the most economical method for running water or sewer laterals. The Hydrauger setting requires very little excavating—and it entirely avoids a tremendous amount of pavement cutting, trenching, shoring, back-filling, compaction and re-paving.

NEW HIGHER POWERED AIR-MOTORS

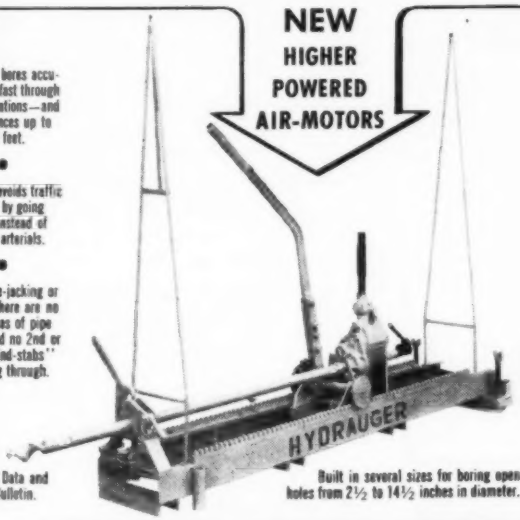
Hydrauger bores accurately and fast through most formations—and for distances up to 150 feet.

•

Hydrauger avoids traffic hazards by going UNDER instead of through arterials.

•

Unlike pipe-jacking or ramming there are no total losses of pipe strings, and no 2nd or 3rd "blind-stabs" at getting through.



Write for Engineering Data and Illustrated Bulletin.

Built in several sizes for boring open holes from 2½ to 14½ inches in diameter.

HYDRAUGER

HYDRAUGER CORPORATION, LTD.
116 New Montgomery St., SAN FRANCISCO 5, CALIFORNIA

WEATHER FORECAST: Rain — Sleet — Snow!

STOP BACKWATER FROM SEWERS . . . this easy way

Heavy rain, sleet and snow in the coming months will overtax your sewer systems sending floods of backwater and sewage into the basements of many homes in your community.

JOSAM SIDE-SWING BACKWATER SEWER VALVES *Eliminate This Danger!*

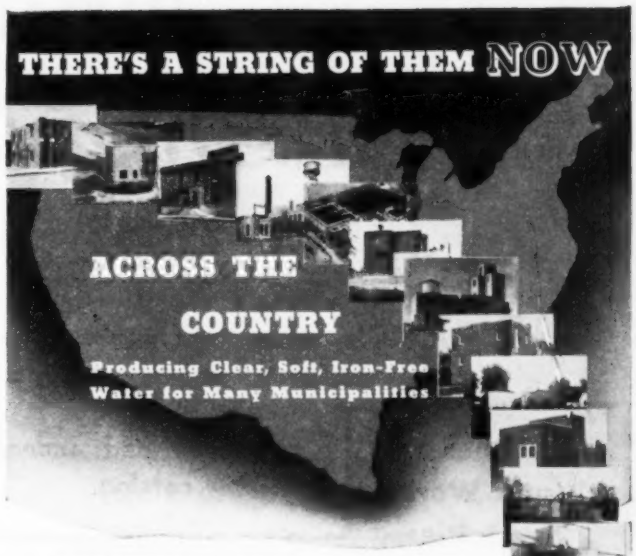
Installed at proper points in the sewage system, Josam Side-Swing Backwater Sewer Valves permanently keep backwater out of basements. The flap valve in this exclusive device permits speedy drainage yet closes tight at the slightest backflow. It is so inexpensive compared with the inconvenience avoided and damage prevented to property, equipment and merchandise that it should be installed at once! For further information write for free folder on Backwater Control.

JOSAM MANUFACTURING COMPANY
320 EMPIRE BUILDING • • • CLEVELAND 14, OHIO

JOSAM-PACIFIC CO., San Francisco, Calif. — *West Coast Distributors*
EMPIRE BRASS CO., Ltd., London, Ont. — *Canadian Distributors*

THERE ARE NO SUBSTITUTES FOR JOSAM PRODUCTS

THERE'S A STRING OF THEM NOW



ACCELATORS are doing a lot of different things for a lot of different kinds of water . . . clarifying . . . softening . . . stabilizing . . . removing color . . . taking out iron.

Results are always excellent . . . frequently remarkable.

You can't beat ACCELATORS for Performance and Economy. Would you like Bulletin 1824?

INFILCO
INCORPORATED
3331 W. 25th PLACE, CHICAGO 16, ILL.

Community and Facility	Estimated Cost
Wagoner (sewage)	153,800
Wagoner (sewage)	98,210
Wagoner (water)	62,542
Wagoner (water)	56,494
Pennsylvania:	
Northumberland (sewage)	62,000
Rhode Island:	
Tiverton (water)	318,000
South Carolina:	
Manning (water)	116,300
Pamplico (sewage)	41,171
Town of Manning (water)	18,200
Tennessee:	
Dunlap (water)	88,720
Gattinburg (water)	246,800
Gattinburg (sewage)	154,200
Texas:	
Baytown (water)	89,500
Clebrune (water)	175,000
Crandall (water)	35,000
Decatur (sewage)	50,000
Galveston County (water and sewage)	59,500
Hamilton (sewage)	27,000
Harris County (sewage)	79,579
Utah:	
American Fork (water)	31,800
Bountiful (sewage)	633,000
Ferron (water)	15,900
Salt Lake County (sewage)	273,000
Salt Lake County (sewage)	143,000
Salt Lake County (sewage)	121,340
Salt Lake County (sewage)	100,000
Vermont:	
Battleboro (sewage)	255,500
Brattleboro (sewage)	141,600
Brattleboro (water)	110,670
Brattleboro (water)	179,600
Montpelier (water)	256,100
Montpelier (water)	75,000
Montpelier (water)	6,800
Virginia:	
Marion (sewage)	32,000
Washington:	
Burlington (sewage)	168,000
Monroe (sewage)	107,276
West Virginia:	
South Parkersburg (sewage)	93,000

IT PAYS FOR ITSELF OVER AND OVER—AGAIN

MARLOW

SELF PRIMING *Centrifugal* PUMP

This light weight 2" pump, now being made in aluminum, will deliver 7,000 gals. per hour and weighs but 96 pounds. It is equipped with 4 cycle, 3 H.P. easy-to-start engine with speed control and anti-friction bearings. It is durable, a fine performer and economical. Write for Marlow catalog.

Other Water Works Specialties

Pipe Cutters • Pipe Pushers • Repair Couplings • Floodlight Generators • Floodlights • Pipe Thawers • Pipe Finders • Valve Box Locators • Leak Locators • Clayton Control Valves • Gauges • Chase Copper Tubing • Denco 180° Wrench • The Meter-Master • Meter Seals • Lanterns • Torches and many more

NORTHROP & COMPANY, INC.

Water Works Specialties and Supplies

50 CHURCH STREET • NEW YORK 7, N. Y.

Municipal Public Works Operations

The Amer. Pub. Works Assoc. of Chicago has issued Bull. No. 24 (price $1.50) titled "Organizing for Municipal Public Works Operations." This Bull. No. 24 is a study of the departmental structure in small, medium-sized, and large cities and the material is a reprint of three papers presented at the 1944 Public Works Congress.

The authors are Robert L. Anderson, Supt. of Pub. Wks., Winnetka, Ill. (pop. 13,000); Kenneth K. King, Dir. of Pub. Wks., Kansas City, Mo. (pop. 450,000), and Glenn C. Richards, Commissioner of Public Works, Detroit, Mich. (pop. 1,500,000).

Mr. Anderson points out that while there are 199 cities in the U. S. with populations over 50,000 (accounting for 45,000,000 persons), there are 878 cities with populations between 10,000 and 50,000 (accounting for 17,000,000 persons). There are 965 cities below 10,000 population.

Taking the theme that "the municipality's sole reason for existence is to provide public services," Mr. Anderson treats of these services in the smaller sized communities. Among other things Anderson stresses "the importance of the water supply system and the fact that its operation warrants and requires a good technical man."

Other utility services, purchasing, buildings, etc., are also discussed. Mr. Anderson points out that the combination of superintendent of public works and village engineer is a natural and common one in cities in this group.

Mr. King has discussed the functional organization of public works in Kansas City and the development of a revised organizational setup. Two charts are presented, one showing the original organization and the other the desirable reorganization of the public works department to eliminate duplication, overlapping, confusion, and weak lines of authority. The water division does not come under the Public Works Dept., but sewers and sewage pumping stations do. These charts are of interest even to persons in smaller cities because they indicate the variety and extent of the work of a public works department.

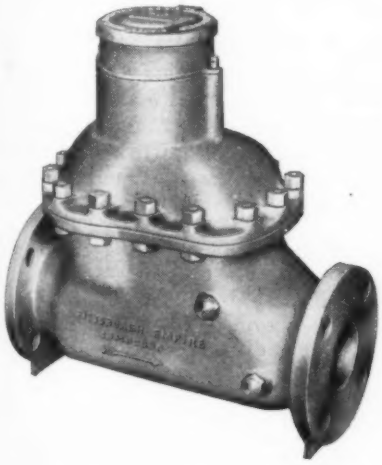
Because of the fact that there are few cities of over 500,000, Mr. Glenn C. Richards confined his remarks about Detroit to the discussion of how Detroit had solved problems common to all public works departments, such as personnel, accounting, engineering and the variety of factors considered a part thereof.

Bull. No. 24 also contains the open forum discussion on public works problems. The bulletin may be obtained from the American Public Works Association, 1313 E. 60th St., Chicago 37, Ill.

MANUFACTURERS' and EQUIPMENT NEWS

New Compound Meter

The Pittsburgh Equitable Meter Company, Pittsburgh, Pa., has announced a new line of Pittsburgh-Empire Compound Water Meters, with a single register. Through use of an over-riding clutch coordinator the single register records the flows of both the velocity and displacement measuring units.



The interior design includes a horizontally positioned propeller with a shaft mounted on hard rubber roller bearings, and a full-opening, swing action valve with compensating linkage, thereby providing a straight-through passageway for large volume flows, with a low head loss.

An Empire oscillating piston meter is used to measure flow rates below the accurate capacity of the propeller unit. The piston meter is mounted immediately above the propeller cage. A feature is that *both* velocity and displacement meter units operate at *all* flow rates. Accordingly, there is no detectable accuracy drop at the change-over point. The unit is smaller than previous compounds of the same capacity and comes in a complete range of size.

A bulletin describing the features of this new meter may be obtained by writing Pittsburgh Equitable Meter Co., 400 N. Lexington Ave., Pittsburgh 8, Pa. Ask for bulletin W-803.

Grinnell Check Valves Prevent Water Contamination Eliminate Waste

Uniflow Check Valve

Grinnell Uniflow Check Valves, used in pairs in public water service pipes to private fire systems, prevent water from a secondary source backing up in public mains, thus preventing contamination. Valves are all bronze, with bronze clappers and moulded rubber facings.

Detector Check with Meter in By-Pass

This "detector" device guards against leakage or possible misuse of water provided for fire protection purposes. The Detector Check measures water flows accurately up to 25 gallons per minute.

These valves are made to specifications approved by Factory Mutual Laboratories, and Underwriters' Laboratories, Inc. Write today for Grinnell catalog "Water Works Specialties" giving complete details on fittings, clamps, valves and specialties for Water Works. Grinnell Company, Inc., Executive Offices, Providence, 1, Rhode Island. Branch offices in principal cities.

GRINNELL

WHENEVER PIPING IS INVOLVED

Foamglas Insulation Improved

Several improvements in the new cellular glass insulation, Foamglas, have been made during the past months, according to the Pittsburgh Corning Corp., manufacturers of the product.

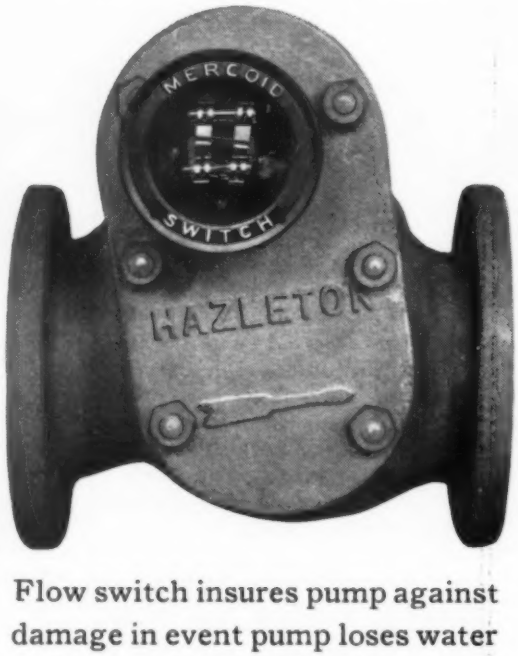
One change increases the number of cells per cubic foot from 5,000,000 to 10,000,000, thus providing additional thermal protection.

The "K" value or conductivity of

Hazleton Type "M"

CHECK VALVE

with Built-in Mercoid Motor Shut-off Switch for Automatic Pump Protection



PROTECTS PUMP FROM DAMAGE DUE TO LOSS OF WATER

PREVENTS OPERATION OF PUMP UNTIL PROPERLY PRIMED

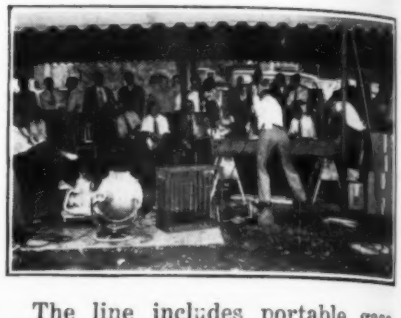
Flow switch insures pump against damage in event pump loses water during operation. Mercoid switch is actuated by valve flap. Switch is connected into no-voltage coil of motor starter.

Write for Further Information.

BARRETT, HAENTJENS & CO.
HAZLETON PENNSYLVANIA

Homelite Salesmen See New Models

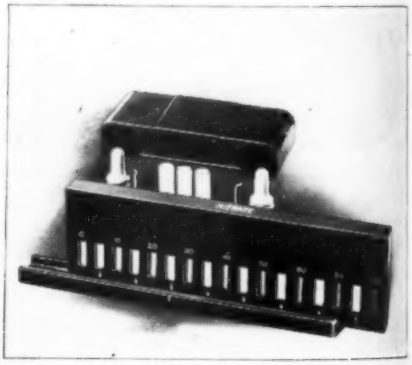
At a recent week-long sales meeting, held in Port Chester, N. Y., the Homelite Corporation of that city demonstrated to its sales representatives from all over the country the more than 40 new Homelite Units.



The line includes portable gasoline-engine-driven generators, pumps and blowers, all of which have been improved. The demonstrations were devoted to uses, designs, construction, and performance of the latest Homelite products. Greater generator capacity was demonstrated, and new methods of ventilating were shown, using the small portable gasoline-engine-driven blowers. Keynote of the conference was improvement of new models over the old pre-war models.

Taylor-Betz Nitrate Slide Comparator

The W. A. Taylor Co. of Baltimore has developed a slide comparator for determining and controlling concentration of nitrates in boiler water. Based on a method developed in the Betz Laboratories in Philadelphia, the set consists of a Taylor pH slide comparator base, with nine color standards from 0 to 100 ppm. of nitrate as NO_3, five 5-ml. test tubes, Brucine and acid reagents, and other necessary equipment.



More complete information on the equipment and the method of mak-

the Foamglas measured as Btu./hr./sq. ft./° F./in. has been reduced and is now 0.40 at 50° F. and 0.55 at 300° F.

Foamglas is a new, inorganic, cellular insulation that is particularly adaptable for use in industrial buildings and equipment. Being composed of specially prepared glass, cellulated under intense heat, the product is fireproof, waterproof and vermin-proof. Its inorganic nature makes it permanent as it is not subject to deterioration from common elements affecting insulations containing organic substances.

"Dick" Ford Back with Ford Meter Box

Lt. Commander Richard Ford, Vice Pres. of the Ford Meter Box Co. of Wabash, Ind., has been discharged from the Navy and is again representing the Ford Meter Box Co. in the eastern United States. Commander Ford has been in the service since July, 1942.

ing the test may be obtained from W. A. Taylor & Co., 7300 York Rd., Baltimore 4, Md.

C. H. Morse, III, V. P. Fairbanks, Morse

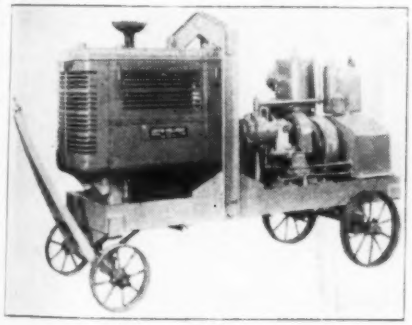
Charles H. Morse, III, has been elected vice president of Fairbanks, Morse & Co., according to an announcement of Col. Robert H. Morse, Pres.

Charles H. Morse, III

Mr. Morse, III, will be in charge of research patents, traffic, the company's western pump division, and the Inland Utilities Co., a F-M subsidiary. Mr. Morse entered the employ of the company after World War I and progressed through various departments learning the production of the company's products. In 1935 he was elected president of Inland Utilities.

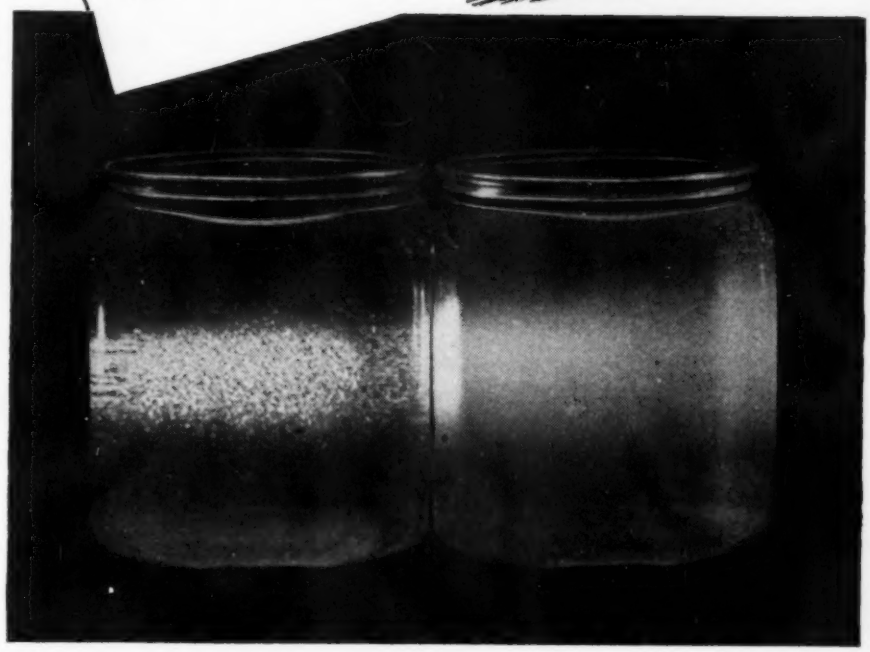
New Model Griffin Wellpoint Pump

A new addition to the Griffin Wellpoint Equipment is the Model 108-D, 10 x 8 Vac-U-Matic Wellpoint Pump powered with an International UD-9 engine. With an increased horsepower, this model pump now delivers 2800 gpm.—300 gpm. greater than its former rating with a gasoline engine.



This new pump with the diesel engine is the first introduction of diesel power to wellpoint equipment. In addition to diesel power and larger pump capacity, several mechanical improvements are also incorporated in this pump, particularly the elimination of all packing in the stuffing box. A catalog, "Griffin Pointed Wellpoint Facts" is available on request to the Griffin Wellpoint Corp., 881 E. 141st St., New York 54, N. Y.

Design FOR SPARKLING CLEAR WATER BEGINS HERE



How N-Sol-A, made with N Brand Silicate, can increase the rate of growth of the floc is demonstrated in the above jars. Right jar, alum; left, alum and N-Sol-A. The floc is large, tough, and rapid-settling.

Improved quality of finished water is the reason why many plants have selected an N-Sol Process. In other cases, N-Sol has increased capacity through higher flow rates and longer filter runs, which permits the design of a smaller plant to fit specifications.

Before you complete your plan for a new filtration plant, ask for information about the four processes of treating water with activated silica. You'll also want the handy literature folder (#52-8) containing bulletins and reprints of technical articles, describing the use of N-Sol Processes. Free on request.

Four processes to fit any water treatment procedure — save space, save money.

N-Sol-A*—N Brand reacted with ammonium sulfate. Used where chloramine sterilization is desired.

N-Sol-B—N Brand reacted with alum. Used with any sterilization procedure. (U.S. Pat. No. 2,310,009)

N-Sol-C*—N Brand reacted with chlorine. Used with any chlorine sterilization.

Baylis Sol—N Brand reacted with sulphuric acid. Used with any sterilization procedure. (U.S. Pat. No. 2,217,466)

* Patent Applied For

N-SOL PROCESSES FOR WATER COAGULATION

DEVELOPED AND PATENTED BY
PHILADELPHIA QUARTZ COMPANY, PHILADELPHIA 6
AVAILABLE UNDER LICENSE WITHOUT CHARGE

New York City's **BOWERY BAY SEWAGE PLANT** *Handles 40 Mgd. . . .*

With **5**

Three 18" Mixedflo pumps deliver 7,000 gpm., each against a 10' tdh., with a maximum speed of 500 rpm.

Two 6" pumps deliver 1500 gpm. each, against a 35' tdh. at a maximum speed of 860 rpm.

MORRIS PUMPS

Return Sludge Pumps

Three 18" Mixedflo Morris Centrifugal Pumps delivering a combined total of 21,000 gpm., handle the return sludge in the activated sludge process of New York City's Bowery Bay Sewage Treatment Plant. The total dynamic head is only 10', but the efficient Mixedflo impellers permit the reasonably high operating speed of 500 rpm. eliminating need for specially built low-speed motors.

Excess Sludge Pumps

Between the settling tanks and the sludge thickening tanks, two standard Morris Centrifugal Pumps of non-clogging design, with 8" suction and 6" discharge outlets, give a combined flow of 3,000 gpm., against a total dynamic head of 35', at a speed of 860 rpm.

All 5 pumps are of the horizontal type, and all 5 are directly connected to variable-speed motors to permit flexible adaptation to other heads and capacities.

The installation, now in its 4th year of operation, is unusual because of the low operating pressures encountered. But whether heads are high or low, Morris engineers have designs especially adapted to the conditions. Consult our engineers now regarding your particular needs.

MORRIS MACHINE WORKS
BALDWINSVILLE, N. Y.
Branch Offices in Principal Cities

MORRIS **CENTRIFUGAL PUMPS**

Horgan Advanced at Ralph B. Carter Co.

Announcement has been made by the Ralph B. Carter Co. of the promotion of J. J. Horgan to the position of Assistant Sales Manager. Mr. Horgan has been associated with the company since 1938, serving as Sales Engineer in the Sanitary Division, covering the Northern New Jersey, New York State and New England territories. Previously he had served with Gibbs & Hill and Madigan & Hyland, Consulting Engineers of New York City.

J. J. Horgan.

Utility Dirt Mover and Bulldozer

For municipalities or contractors that have need for levelling, bulldozing, or covering of waste materials with dirt, good news comes in the form of an announcement from the Oliver Corp. of a crawler tractor equipped with a special combination bulldozer head and bucket type scraper. This equipment unit consists of a gasoline powered, 61 drawbar horsepower Oliver "Clertrac" Tractor equipped with a Drott Bullclam.

This unit will load itself, a yard at a time, and haul the dirt or refuse anywhere without droppings, then dump the load and spread it evenly. All operations are mechanical and require only one operator. The equipment may be used to transport, level, and cover refuse, ashes, and trenching or excavation spoil.

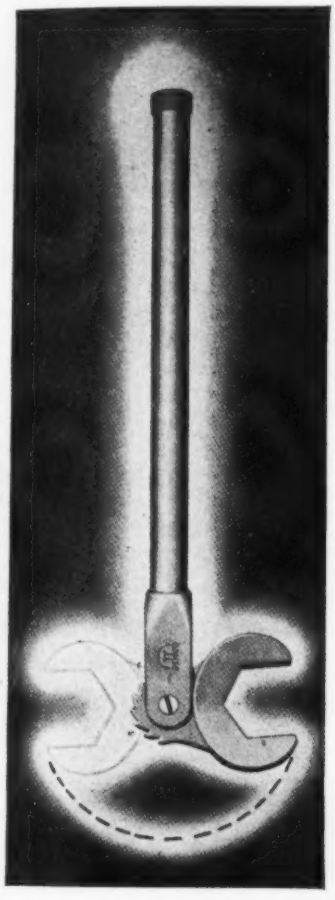
For scraping, levelling off, or backfilling, the front apron of the Bullclam is held up. The weight of the tractor is useful in packing the fill. Power is applied to both crawlers all of the time, and the tractors can travel over the roughest terrain.

In the illustration shown, the city of Topeka, Kans., is using one of these Utility Bulldozers to spread and earth-cover refuse. It has proved very effective for that purpose in that municipality. It would prove as effective in a sewage plant having ashes from sludge incineration, or grit, screenings, and trash to dispose of.

Further information on this Utility Dirt Mover and Bulldozer may be obtained from the Oliver Corporation, 400 W. Madison St., Chicago 6, Ill.

New Denco 180° Open End Ratchet Wrench

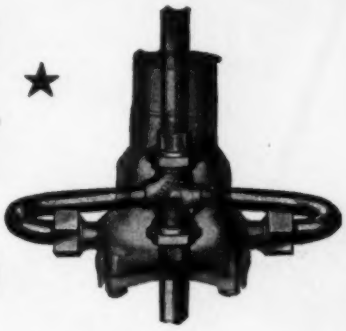
Sole distributor rights east of the Mississippi River for the new 180° Denco open end ratchet wrench have been obtained by Northrop & Co., Inc., 50 Church Street, New York, N. Y.



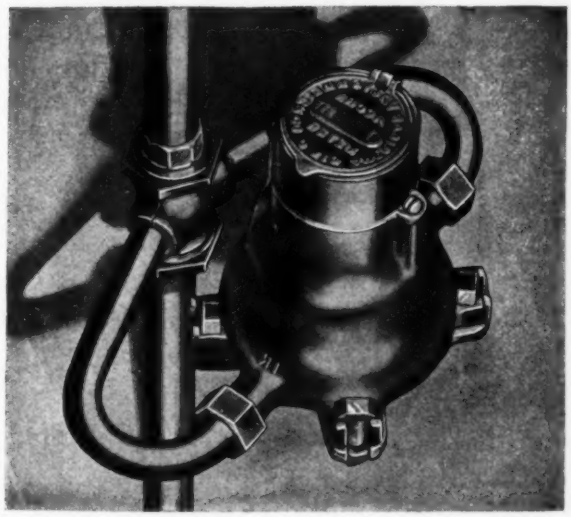
This wrench is especially designed for connecting and disconnecting water meter coupling nuts. It is made in sizes to fit ⅝, ¾, and 1-inch meter couplings and the head may be set at any angle. A whole half turn of the nut (180°) may be made without removing the head from the nut.

The Denco wrench is manufac-

The *IDEAL* ★ BASEMENT SETTING



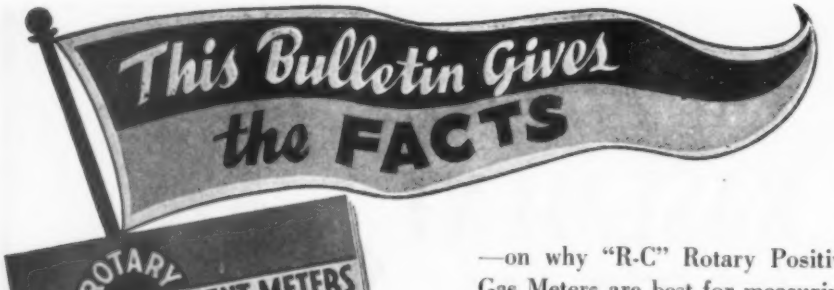
★ FOR EASY INSTALLATION
FOR HYDRAULIC EFFICIENCY
FOR *Trouble-Free* MAINTENANCE
FOR PERMANENT SATISFACTION
FOR APPEARANCE SAKE



The Ford COPPERHORN *looks* like what it is: A beautiful example of efficient, functional design.

For basement water meter settings the Ford COPPERHORN permits the meter to be set at a convenient height. It provides physical connection and support for the customer's piping even with the meter out, insuring trouble-free meter changes. It is all brass and copper, — should last almost forever and pressure loss is almost nil. Saves meter couplings, pipe fittings and electrical bonding. You should send for our catalog and learn more about COPPERHORN advantages.

The FORD METER BOX COMPANY, INC.,
WABASH, INDIANA



—on why "R-C" Rotary Positive Gas Meters are best for measuring sludge gas as produced in the sewage digester tanks.

This Bulletin explains why "R-C" Meters are tops in accuracy and long life; why their built-in accuracy is permanent; why they need no adjustments; and why maintenance cost is the lowest of any gas meter on the market.

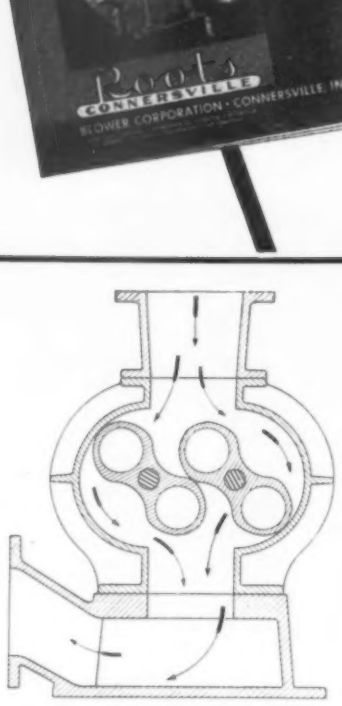
A counter reading direct in cubic feet and a differential gauge measuring drop across the meter are the only instruments required for normal installations. If desired, "R-C" Gas Meters can be provided with a recording instrument to give a permanent chart record of gas flow.

Bulletin 40-B-13 gladly mailed on request.

ROOTS-CONNERSVILLE BLOWER CORP.

One of the Dresser Industries

510 Mount Avenue
Connersville, Indiana



PRINCIPLE OF OPERATION

The gas enters at the top of the meter and the gas pressure causes the perfectly balanced impellers to rotate, carrying the gas to the meter outlet. Impeller shafts are connected to a counter accurately calibrated in accordance with the exact volume displaced by each rotation of the impellers. Impellers do not touch each other or surrounding casing, so there is no internal friction or wear. This clearance of a few thousandths of an inch is precisely maintained by a pair of timing gears during the complete rotation of the impellers, thereby keeping slippage at an absolute minimum. This slippage is a definitely known factor and has been accurately determined and allowed for in each size meter. Accuracy is maintained over a rate of flow from 5% to 150% of normal.

Photo below shows one of two "R-C" Rotary Positive Displacement Meters installed at Richmond, Indiana. Capacity of each, 10,500 CFHr.

Roots CONNERSVILLE SINCE 1854 Rotary Positive GAS METERS

tured by the Denco Sales Co. of Glendale, Calif., who are distributing these wrenches west of the Mississippi.

G.E. Appts. Powers Disposall Engineer

J. H. Powers has been appointed engineer of General Electric Disposalls, it has been announced by J. W. McNairy, manager of engineering and planning for the company's Appliance & Merchandise Department.

J. H. Powers.

Mr. Powers has been associated with G. E. since he began work in Schenectady in 1912 on switchgear assemblies. During his career with the company he has been stationed at the Fort Wayne, Ind., and Philadelphia plants. He is a member of the American Society of Mechanical Engineers. Powers made an important contribution to this country's war effort in his work on the development of the Army's bazooka.

Bert Seeholzer to Represent Manufacturers

Bert Seeholzer, Jr., well known in the water works and municipal field in New York and New Jersey, has announced the opening of his own business as a manufacturers' representative for nationally known water works and municipal supplies.

Mr. Seeholzer, who has had 15 years' contact with the water works field, was associated with the Hydraulic Development Corp. for a number of years

and will again represent the company in the sale of Hydrotite, among other materials.

More recently Mr. Seeholzer has been in war work and with Northrop & Co. His new office address will be P. O. Box 91, Westwood, N. J.

Tobin Returns to Electro Rust-Proofing

Announcement has been made by the Electro Rust-Proofing Corporation, Dayton, Ohio, that Major Frank M. Tobin has resigned his commission with the Army Air Force and has resumed his connection with the company, where he is Production Manager.

F. M. Tobin

Major Tobin assisted in the organization of the original Electro Rust-Proofing sales force and entered the service in 1942.

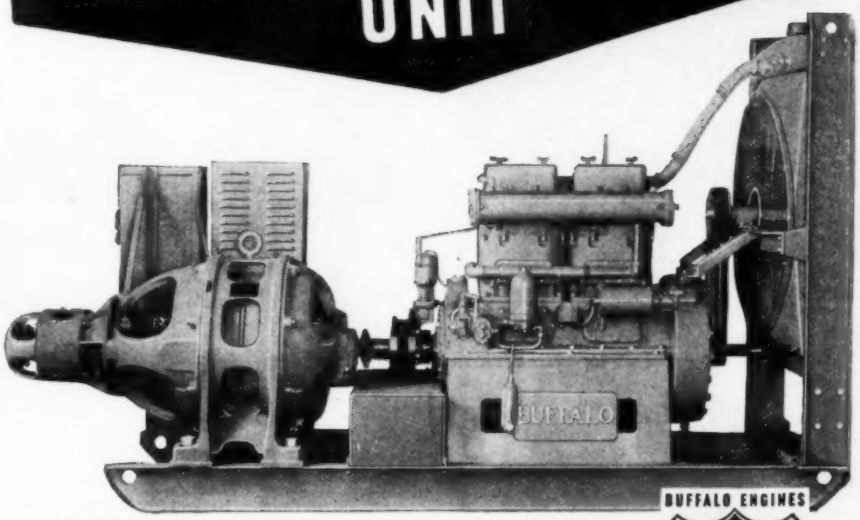
Because of his previous association with the company, Major Tobin is unusually well known in the field it serves, which is rust-prevention on the under-water interior surfaces of metal water tanks, standpipes, flocculators and other water-storage equipment.

Palmetto Asbestos Gaskets

The Palmetto Packing line of Greene-Tweed & Company has been expanded to include High-pressure Folded Asbestos Gaskets, Asbestos Metallic Sheet Packing, and Asbestos Metallic Gasket Tape.

The Gaskets are developed for hand holds, manholes, and tube plates of boilers, etcetera. The asbestos cloth from which these gaskets are made is available as Palmetto Asbestos Metallic Sheet Packing, suitable for cutting gaskets for cylinder heads. The Gasket Tape is made from the same cloth. Further information concerning these products may be obtained from the manufacturer, Greene-Tweed & Co., 238th St. and Bronx Blvd., New York 66, N. Y.

Portable
ENGINE-GENERATOR UNIT



BUFFALO ENGINES
ASSURANCE of PROTECTION

BUFFALO Model RAB-4 four-cylinder Gasoline Engine direct-connected to a 75 KW, 1200 RPM Westinghouse generator. Several units of this particular size and type are in service at the Bethlehem Shipbuilding Plant, Baltimore, Md. The unit is self-contained, including the radiator cooling system, 25-gallon gasoline tank and an enclosed generator control panel; all mounted on the channel frame.

BUFFALO Engines connected to electric generators have been successfully used in hundreds of installations during the war in locations where public service power is not available or where intermittent or stand-by power is needed.

Their record is one of unfailing reliability in service. With automatic stop-start control, full rated power development can be reached within 30 seconds. Buffalo Engines run cleanly, quietly and without vibration at constant speed, producing uniform electric current.

Engine specifications and installation data are available on request. Write for Bulletin No. 61.

BUFFALO GASOLENE MOTOR COMPANY
BUFFALO 13, N. Y., U. S. A.

BUFFALO ENGINES
ASSURANCE of PROTECTION

BUFFALO ENGINES — 100 H. P. THROUGH 750 H. P.— IN GENERATOR AND PUMPING SETS FOR WATER WORKS — AIRPORTS — COMMUNICATIONS — FLOOD CONTROL — HOSPITALS — INSTITUTIONS — MINES — MOVABLE BRIDGES — THEATRES — SEWAGE PLANTS.

EDDY
FIRE HYDRANTS
AND VALVES
WATER WORKS EQUIPMENT

EDDY VALVES
For
Water Works
and
Sewage Disposal
Plants

EDDY FIRE
HYDRANTS
For Fire
Protection
Service

Write for
Complete
Catalog

Eddy
VALVE COMPANY
WATERFORD N.Y.

New Appointments at Ralph B. Carter Co.

According to an announcement from Mr. J. W. Van Atta, Vice President and General Manager, the Ralph B. Carter Co. of Hackensack, N. J., has recently made two new appointments in the Sanitation Division of the Sales Department. The two new appointees are Lewis Klockner and Ralph B. Carter, III, both recently discharged from overseas duty.

Ralph B. Carter, III

Lewis Klockner

Captain Klockner served in the Sanitary Corps, and saw duty in North Africa, Italy and Corsica. He is a graduate engineer of Lafayette College and for ten years was associated with the Bureau of Engineering of the N. J. State Department of Health.

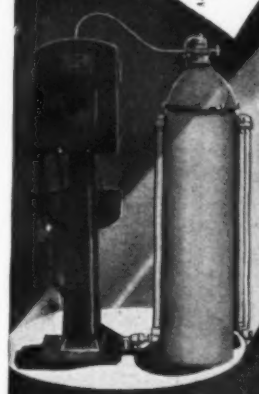
Ralph B. Carter, III, volunteered for overseas duty with the American Field Service. He was assigned to the Ambulance Corps, and saw action during the Central Italian and Appenine campaigns while attached to the British Eighth Army and was later transferred to the North German Theatre of operations with the British Second Army. Mr. Carter is an alumnus of Philips Academy, Andover, Mass., and attended Yale University.

James C. Judge Joins Neptune's Sales Staff

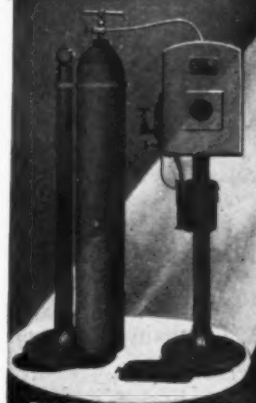
The Neptune Meter Co. has announced the appointment to the sales staff of James C. Judge. He will represent the company in Western Oregon and Western Washington, making his headquarters at the Portland office.

Mr. Judge took a pre-engineering course at Principia College before enlisting in the Army in 1942. He was commissioned a Lieutenant in the Army Air Forces in 1943 and served as pilot on a B-24 with the 8th Air Force, based at Norwich, England. He flew 32 missions and was awarded the Air Medal with three Oak Leaf Clusters and the Distinguished Flying Cross.

ORDER NOW YOUR CHEMCO CHLORINATORS FOR THE 1945 SEASON. IMMEDIATLY AVAILABLE AND PRICED RIGHT
-INVESTIGATE-
Send FOR THE FOLLOWING FREE BULLETINS
BULLETIN 300-1-TYPE M-1
BULLETIN 300-3-TYPE M-3
BULLETIN 300-5-TYPE M-5
R-5-T



CHEMCO TYPE M-1



CHEMCO TYPE M-3

OTHER "CHEMCO" PRODUCTS
FILTERS
WATER SOFTENERS
HYDROGEN ION PLANTS
COMPLETE PURIFICATION SYSTEMS
FOR SWIMMING POOLS ETC.

CHEMCO TYPE M-5

CHEMICAL EQUIPMENT CO.
MAIN OFFICE · LABORATORY · FACTORY
933 CENTER ST. · LOS ANGELES 34 · CALIF.
MID-WEST FACTORY BRANCH
205 W. WACKER DR. · CHICAGO
REPRESENTATIVES IN PRINCIPAL CITIES

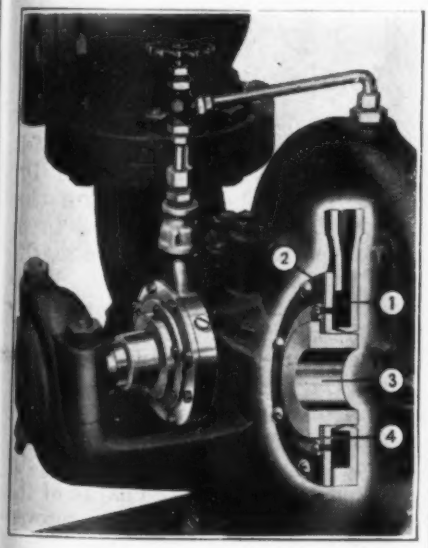
Pocket Circuit Tester

At last there is available a simple, small, pocket circuit tester that is really a vest pocket circuit tester. It will indicate voltage from 90 d.c. and 60 a.c. to 500 volts a.c. or d.c. A General Electric neon lamp on the

top glows in varying intensities, indicating circuit conditions. No glow indicates a dead line. Lighting on as little as one microampere, the tester will locate blown fuses, shoot trouble in cords and appliances, test spark plugs, condensers and armatures. The pocket circuit tester is available from Amerline, 1753 N. Honore St., Chicago 22, Ill.

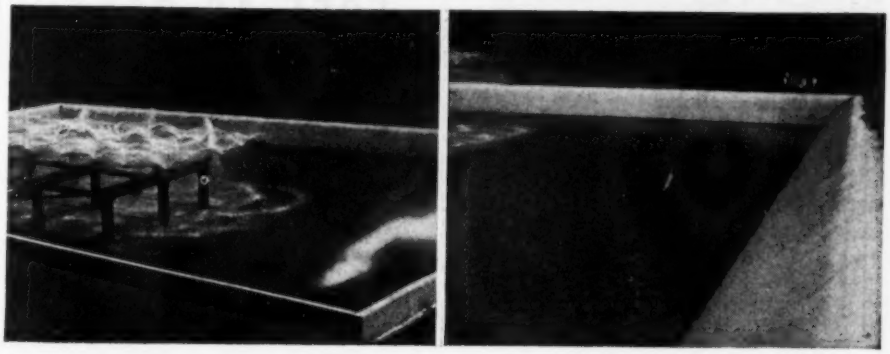
New Jet Shaft Seals

Jet Shaft Seals, heat resistant and non-corrosive seals for horizontal centrifugal pumping units, are said to save a large percentage of pump maintenance costs by eliminating waste of fluid, packing expense and the causes of sleeve and shaft wear; to provide greater continuity of pump service, and to reduce power input by ending packing drag.



In principle the seal draws pressure from the high point and directs it back into the low pressure area of the pump with sufficient force to seal off internal pressures. The liquid flows through (1) the liquid box, inward past (2) the orifice plate and

CEMENT GUN COMPANY
"GUNITE" CONTRACTORS
GENERAL OFFICES—ALLENTOWN, PENNA., U.S.A.



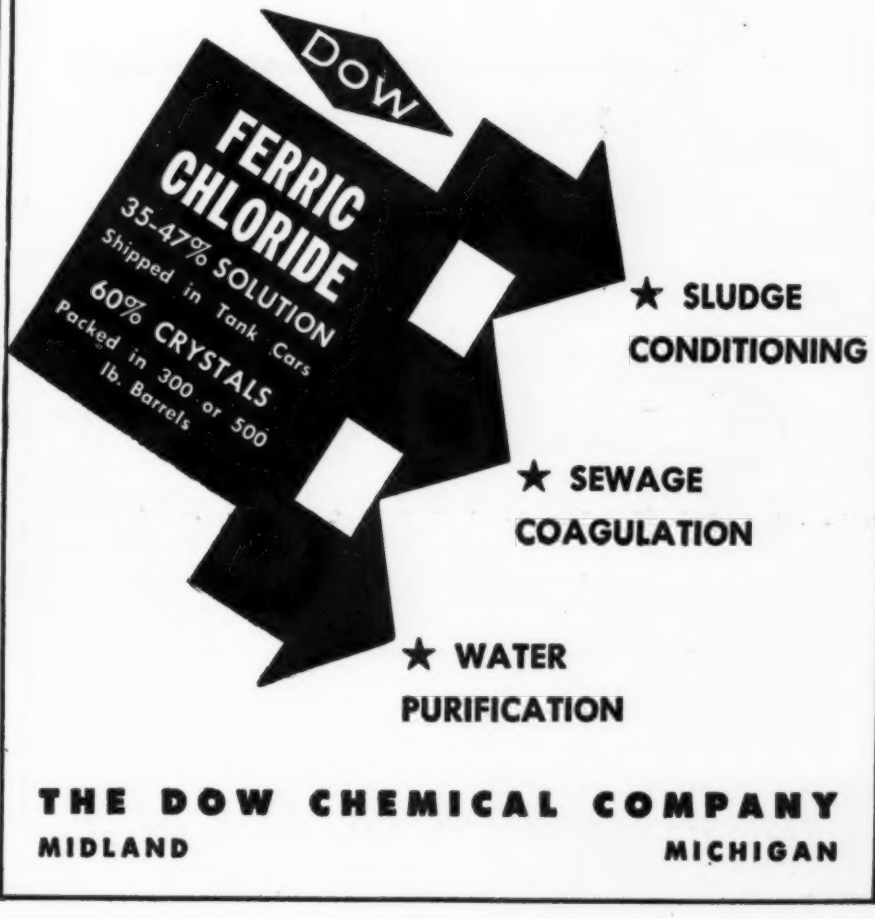
RESERVOIR RE-LINED WITH "GUNITE"

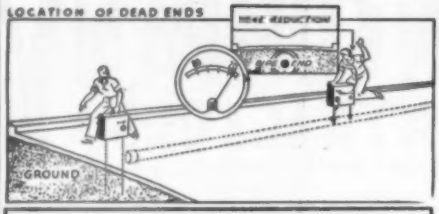
This is a filtered water reservoir at Charlottesville, Va., built many years ago and lined with concrete. It had disintegrated badly, and was leaking excessively in 1937.

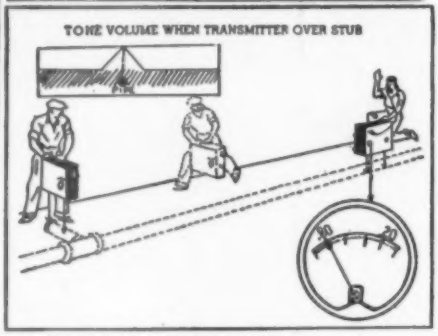
Our Company was engaged to reline this structure during that year. The new lining consisted of two inch mesh reinforced "GUNITE" on the bottom and side slopes, and this entirely eliminated leakage. A recent inspection indicated that this work is still in perfect condtion.

Many similar reservoir jobs and other "GUNITE" construction are described in our Bulletin C 2300. A copy will be sent to you upon request.

MANUFACTURERS OF THE "CEMENT GUN"







M-SCOPE

Buried Pipe Finder and Leak Detector

FREE 16 PAGE BOOKLET UPON REQUEST

The M-SCOPE consists of a specially designed radio Transmitter and Receiver, with conductive wire. In operation, the Transmitter sends out a continuous signal, and when there is no metal between Transmitter and Receiver, a definite volume of sound is heard in the Receiver earphones and the meter (mounted on Receiver) gives a definite reading. If a metal object lies between the two units, sound in earphones is louder and meter reading higher—and the pipe or other metal object is located.

The M-SCOPE is solving — successfully — the varied problems involved in the development, operation and maintenance of buried pipe and cable systems and is in daily use by representative organizations in such important groups as:

- **Government Projects**
- **Municipalities**
- **Sewerage and Water Plants**
- **Consulting Engineers**
- **Airports**
- **Public Utilities**
- **Industrial Plants**
- **Iil and Pipeline Companies**

Write for further particulars and booklet:

FISHER RESEARCH LABORATORY

Direct Teletype **PALO ALTO, CALIFORNIA**

RENSSELAER-BARDWELL

PORTABLE POWER WRENCH

wherever ***High Torque at Low Speed*** is required

Successfully used for operating **GATE VALVES,** Sluice Gates, Pipe Cutters, Pipe Tapping Machines, Hoists, Jacks, etc. Supplied with or without Drill.

Write for Bulletin B-45

RENSSELAER VALVE CO., TROY, N. Y.

back into the pump. Shaft sleeve (3) turns with the shaft, but is not in contact with the orifice plate, so there is no point of wear.

The diaphragm (4) provides a leak-proof seal while the pump is not in operation, being pressed outward by the pressure within the pump against the shoulder of the shaft sleeve. There is no contact while the pump is turning, only momentarily when the pump is actually starting or stopping.

Seals are available in both bronze and stainless steel; sizes for all pumps one inch shaft and over may be obtained from Jet Shaft Seals, Inc., 1452 S. San Pedro St., Los Angeles 15, Cal.

Hooker Receives "E" For Atom Bomb Work

Institutes New Laboratory

Last month, the Hooker Electrochemical Co. of Niagara Falls, N. Y., was awarded the Special Award Army-Navy E Flag with three stars for their work in the production of material for the atomic bomb. The Hooker company was the second industrial concern in the U. S. to receive this special award.

The company has also announced the organization of a Physical Research Laboratory, to provide physical analyses and controls for all phases of chemical work at the Hooker plants. The new laboratory will be under the direction of Dr. L. J. Brady, formerly a Fellow at Mellon Institute, in Pittsburgh.

Penn Salt Appointments

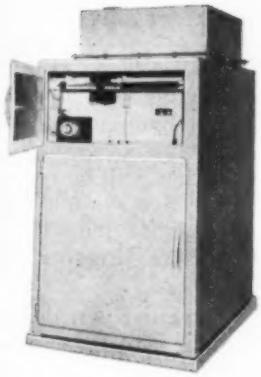
Recent announcements from the Pennsylvania Salt Co., of Philadelphia note the appointment of Dr. E. B. Gunyou, formerly with the Production Division of the U. S. Army Service Forces and Liaison Officer to the Chemicals Bureau, WPB, as Asst. to the Manager of Research and Development. Prior to his army service, Dr. Gunyou was Development Engineer for Graselli Chemicals Dept. of DuPont Co.

Other appointments in the Research Dept. include Dr. Harry G. Walker, who will have charge of the development of new and improved agricultural chemicals, Dr. Thaddeus Parr, as Senior Research Entomologist, and Mr. Murray Zackheim, Chemist in the Agricultural Chemicals group. Dr. Gunyou will be located at the company's general offices, while the other men will be at the Whitemarsh Laboratories.

do your plans call for a gravimetric feeder?

Specify an OMEGA "LOSS-IN-WEIGHT"

Without a doubt, the most accurate type of chemical dry feeder . . . weighs, feeds and records within 1% of rate set on feed dial, bringing laboratory accuracy to plant scale treatment. Successfully handles Ferrisul and such hygroscopic chemicals. Write for Bulletin.



Omega "Loss-in-Weight" Gravimetric Feeder

OTHER OMEGA PRODUCTS

Volumetric Feeders
Solution Feeders
Lime Slaking Equipment
Mechanical Agitators
Bucket Elevators
Laboratory Stirrers

Bulletins on Request

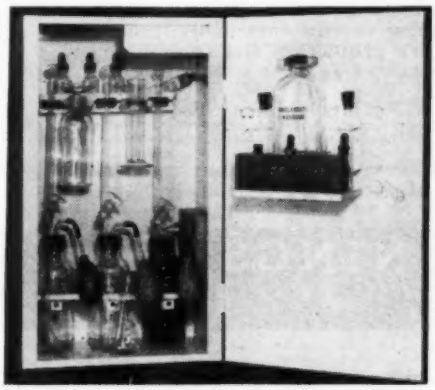
Sincerely
OMEGA MACHINE CO.
(Division of Builders Iron Foundry)
9N CODDING ST., PROVIDENCE 1, R. I.

Mr. Fred C. Abbott has been appointed Manager of the New Products Division of the Company. He has previously been associated with the Market Research and Sales Departments since joining the company in 1943.

Testing Unit for Water Analysis

Also New Stopcock Grease

The TruTest Laboratories, Inc., Philadelphia, Pa., has developed a compact, economical, but completely equipped "Testmaster Junior" for water analysis, including the tests for Hardness, Alkalinity to P and MO, and chloride for maintaining suitable boiler feed and process water conditions.



The company has also developed a new lubricant for stopcocks to meet the need for an all-purpose, stainless, resistant lubricant that prevehts sticking of laboratory stopcocks. Its consistency is about that of vasoline but remains constant over a wide range of temperature. A trial sample will be furnished on request.

The Tru-Test Laboratories are located at 261 S. 3rd St., Philadelphia 6, Pa.

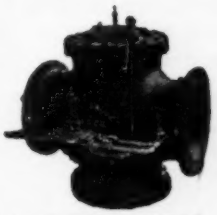
Twentieth Anniversary for W. H. and L. D. Betz

According to the October issue of *The Betz Indicator*, W. H. and L. D. Betz celebrated the 20th anniversary of the organization of their company in that month. Beginning operations principally in the field of boiler water treatment, expansion followed with the inclusion of a Consulting Division and a Laboratory Supply Division. Laboratory and research facilities were also expanded. In two decades W. H. and L. D. Betz, their chemists, their engineers, their laboratories, and their service have become well known in the field of water and waste treatment.

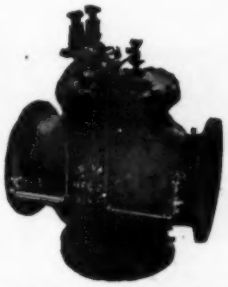
· 1879 ·
ROSS
AUTOMATIC VALVES

ALTITUDE VALVES • SURGE • RELIEF • BACK PRESSURE VALVES

FLOAT VALVES • REDUCING AND REGULATING VALVES



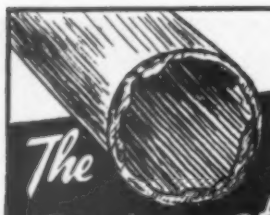
ALTITUDE VALVES
for
Control of elevation and heads into and out of tanks, basins and reservoirs, hydraulic control.
1. Single acting.
2. Double acting.
3. Combination assembly for three or more automatic operations.
4. Can be equipped with electric and manual controls.



COMBINATION VALVE
This valve will permit flow in one or both directions acting as
1. Pressure Reducing and Relief Valve.
2. Pressure Reducing and Altitude Valve.
3. Relief and Altitude Valve.

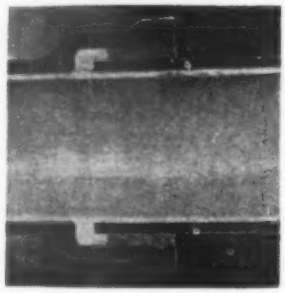
REMOTE CONTROL VALVE
Electric remote control—solenoid or motor can be furnished.
Adapted for use as primary or secondary control on any of the hydraulically controlled or operated valves.

ROSS VALVE MFG. CO.
INCORPORATED
P. O. BOX 595, TROY, N. Y.



The TATE Cement Lining Process
Restores efficiency of old Water Mains

Now is the time to investigate the Tate Cement Lining process —and see what it can do to restore the efficiency of your old water mains.



View showing Tate Process in Pipe Joint. Note thoroughness of Lining.

Write for Literature.

What the TATE Process accomplishes

1. Water mains cleaned and cement-lined without removing pipe.
2. Eliminates discoloration and further cleaning costs.
3. Reduces pumping costs.
4. Restores reduction in head and flow co-efficients. This means full fire protection and lowered insurance rates.
5. All joints cement-lined . . . just one continuous pipe.
6. Does the job without interruption of service to consumer.

TATE PIPE LININGS, Inc.
ANDOVER, MASS.

STOP FISH!

By Electronics

This patented fish control method employs modern electronics in overcoming a serious operating and maintenance problem. Fish of all sizes are kept at a *safe distance* from intake structures, or screens, by the use of an Electronic Control Unit. This equipment, generating special electrical impulses, energizes an electrode system designed and engineered for your particular fish control problem.

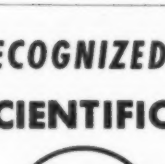
The Burkey Electric Fish Screen has been thoroughly proven through years of service in Condensing Water Intakes, Hydroelectric Plants, Water Systems and Industrial Pumping Installations.

DOES NOT STUN OR KILL FISH

Recommended by State Conservation Officials. Free literature and quotations upon request.

Electric Fish Screen Co.
1130 No. Poinsettia Place, Hollywood 46, Calif.

RECOGNIZED AS THE MOST SCIENTIFIC METHOD...



Taylor
LIQUITROL

THE MODERN METHOD TO CONTROL pH, CHLORINE AND PHOSPHATES

Accurate determinations of pH and chlorine values in water are vital in water works and sewage plants. For on such determinations may depend the health of thousands of families in the community.

Engineers and chemists find that Taylor Liquitrol Method has been specifically designed for them . . . that it is the one portable method for easy, simple and quick determinations in any part of their plants. And, above all, they find Taylor Liquitrol Method the most accurate, for all Taylor Liquid Color Standards are guaranteed unconditionally against fading.

New 88-page book just off the press!

Gives complete details on Taylor Liquitrol Methods, procedures and outfits. See your dealer or write for your FREE copy.

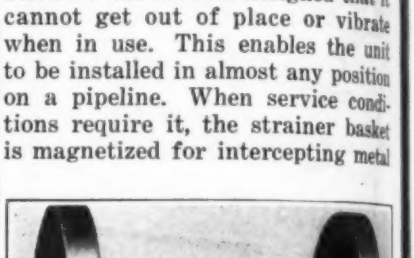
W. A. TAYLOR AND CO.
7308 YORK RD. • BALTIMORE-4, MD.

R. D. Wood Moves Offices

The Philadelphia offices of the R. D. Wood Co. are now located in the Public Ledger Building, Independence Square, Philadelphia 5, Pa. The Company which was founded 142 years ago has supplied cast iron pipe, Mathews hydrants and gate valves to the water works industry for half of its corporate life.

New Zurn "Y" Strainer

The J. A. Zurn Mfg. Co. of Erie, Pa., has designed a "Y" strainer with a snug fitting strainer sleeve unit to assure trouble free operation. This strainer sleeve is removable but it is so designed that it cannot get out of place or vibrate when in use. This enables the unit to be installed in almost any position on a pipeline. When service conditions require it, the strainer basket is magnetized for intercepting metal



particles that are extremely ruinous to valve seats and vital parts of operating pipeline equipment.

All units are hydrostatically tested according to the service pressures under which they will be required to operate. They are available with or without a cleanout plug or can be furnished with a threaded blow-off connection.

This "Y" strainer is manufactured in cast bronze, steel, semi-steel or cast iron, depending upon the conditions to which it is subjected. A wide range of sizes is available for flanged, welded or threaded connections.

Alkacite Corrosion Resistant Coatings

A new corrosion resistant series of coatings or paint, based on a natural product said to be penetrating, protective and highly resistant to moisture, is now being marketed by Protective Coatings, Inc., Box 56, Detroit 27, Mich. Known as the Alkacite series and obtainable for spraying or brushing, it is said not to crack, alligator, check, loosen or

scale, while offering protection against corrosion to tunnels, conduits, gas and oil tanks and water tanks. The material will also waterproof wood and concrete. Special problems are requested for submission to the company. Perhaps this material may find some application on sewage treatment plant equipment.

LITERATURE AND CATALOGS

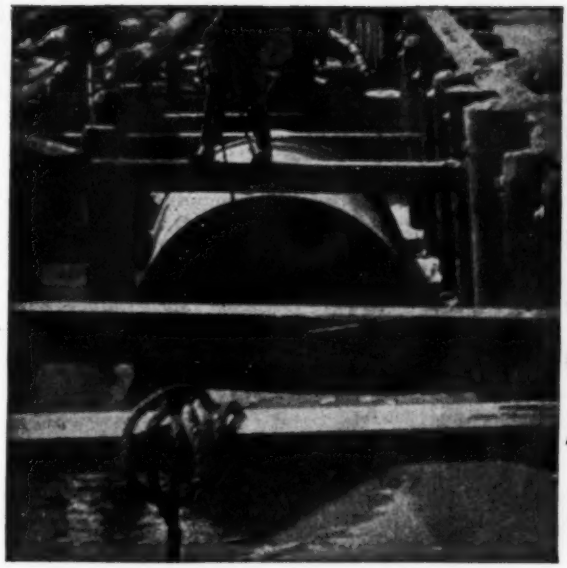
According to the frontispiece of Wallace and Tiernan's Technical Publication No. 213 titled **Break-Point Chlorination Practices,** by A. E. Griffin, "this pamphlet is devoted to the various tests used in the practice and control of break-point chlorination."

Prepared as a service to users of the process, the text contains the latest available information on the subject. While the bulletin does not contain any information on the accomplishments of break-point chlorination, it does contain a discussion of the process, its control and directions for the following: Laux Test, Ortho-tolidine-arsenite Test, modified Laux-Nickel Flash Test, Moore Test for Free Chlorine, Keinath Test for Free Chlorine, and a technic for the drop dilution method. Also included is a Laboratory Method for the Study of Break-Point Chlorination.

Whether or not you use break-point chlorination, this W. & T. Tech. Publ. No. 213 should be in your file. Write to Wallace and Tiernan, Newark, N. J. At the same time you might ask for a reprint titled **Chlorine Destroys Ammonia,** also by A. E. Griffin. This abstract of a paper delivered at the Fifth Annual Water Conference of the Engrs. Soc. of West. Pa. in Oct., 1944, is devoted to the method of removing ammonia from boiler water by chlorination to the break-point.

* * *

There's always something beside the Minute Mystery in **The Pioneer,** issued by the Niagara Alkali Co. This time (October issue) there is an interesting story about the use of radio in water works. Among other things, it can warn against contamination, hurricanes, floods or other catastrophes. Radio can also



84" pipe—Spring Lake, N. J.

FLANGED PIPE

FLEXIBLE JOINT PIPE

BELL & SPIGOT PIPE

SPECIAL CASTINGS

SHORT BODY BELL & SPIGOT SPECIALS

Large stock enables us to make prompt shipments.

CAST IRON PIPE

SIZES 2" TO 84"

Warren Foundry & Pipe Corp.

11 Broadway, New York

Warren Pipe Company of Mass., Inc.

MORE WATER —LESS WORRY

by CLEANING your WATER MAINS using The NATIONAL METHOD

No need to worry about reduced water main capacities just when you need every gallon you can pump. Do as many other communities — large and small — are doing: clean those old clogged up mains by using the NATIONAL METHOD of water main cleaning.

We offer you (1) greater volume of water; (2) lower pumping costs; (3) improved pressure; (4) cleaner water and (5) reduced insurance rates.

GUARANTEED TO RESTORE 95% ORIGINAL CAPACITY

The National Water Main Cleaning Co.

30 Church St. Branches: New York 7

1221 Mortgage Guarantee Bldg., Atlanta 3, Ga. 2028 Union Ave., Montreal 2, Can.
607 First Nat'l Bank Bldg., Birmingham, 3 Ala. 3812 Castellar St., Omaha 5, Neb.
115 Peterboro St., Boston 15, Mass. 210 E. Franklin St., Richmond 19, Va.
205 West Wacker Dr., Chicago 6, Ill. 7103 Dale Ave., St. Louis 17, Mo.
P. O. Box 683, Jacksonville 1, Fla. 501 Howard St., San Francisco, Calif.
3707 Madison St., Kansas City 2, Mo. P. O. Box 887, Waco, Texas
576 Wall St., Winnipeg, Can.

LEADITE
The Pioneer Self Caulking Material for C. I. Pipe
Widely Known

and used by
water works men
LEADITE saves in cost of material . . . in caulking charges . . . in digging of large bell holes . . . in cost of trench pumping! Makes a good, tight, lasting joint!
THE LEADITE COMPANY
Girard Trust Co. Bldg., Pittsburgh, Pa.
No Caulking

FOR BETTER
pH Control
and WATER TESTS
there is nothing like

NON-FADING
GLASS COLOR
STANDARDS
Pocket
Comparator
No. 605
Permanent reliability of Hellige Glass Color Standards, accuracy of color comparison, simplicity of the technique, and compactness of the apparatus are exclusive features of Hellige Comparators not found in any similar outfits.
WRITE FOR BULLETIN No. 602
HELLIGE
INCORPORATED
3718 NORTHERN BLVD. LONG ISLAND CITY 1, N.Y.
HEADQUARTERS FOR COLORIMETRIC APPARATUS

locate and facilitate procurement of emergency supplies, correct false impressions, locate missing persons, etc. All of these things commercial radio has done. Now this tool can be adapted to use by water works themselves. It has even been effectively used in locating leaks in water mains, as Allan Drake told us a few months ago in an article in *Water Works and Sewerage.*

In this issue of **The Pioneer,** there is also a short story about a modern bio-filtration plant eliminating dangerous pollution at Lompoc, Calif. The danger to a nearby water supply was caused by a rapid growth of the community and overload of sewage facilities. The bio-filter plant solved the problem. There's always a lot of interesting little items in this publication and you can receive a copy of this interesting publication regularly, if you'll write the Niagara Alkali Co., 60 E. 42nd St., New York 17, N. Y.

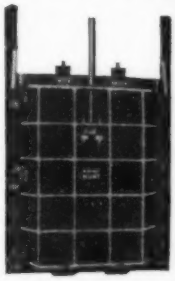
* * *

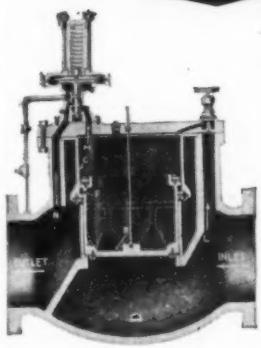
To keep abreast of the sewage equipment news one needs all of the latest catalogs and one of the most recent concerns **Rex Mechanically Cleaned Bar Screens,** which are described in a new 8 page booklet. This bulletin, No. 479, tells what the machine is and how it operates, as well as presenting its exclusive features. Typical job photographs and application drawings are shown. A section of the brochure describes the Rex Triturator as used in conjunction with the bar screen. Data tables and specifications are also included. Bring your catalog file up to date, write Chain Belt Company, 1600 W. Bruce St., Milwaukee 4, Wis., requesting bulletin No. 479.

* * *

It's here, the *Standardized* Mechanical Joint for Cast Iron Pipe, according to a full spread announcement in the October issue of **Cast Iron Pipe News,** published by the Cast Iron Pipe Research Assn. This standardized mechanical joint is now available for cast iron pipe up to 12 inches in diameter. All members of the C. I. Pipe Research Assn. are now prepared to furnish this joint with interchangeable parts. Larger sizes will be available later.

This issue of C.I. Pipe News also contains stories on San Diego's 21,000 feet of C.I. Main; Chicago's Three Miles of 36-in. C.I. Main; and Chicago's large tonnage use of C.I. Pipe in the new So. District Filtration Plant.

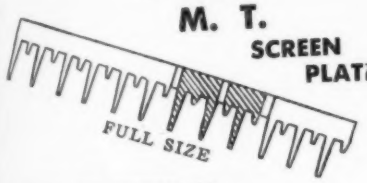
RODNEY HUNT

GATES and HOISTS
Metal or timber sluice gates of all sizes and designs, approved by engineers everywhere. Improved gate stands and hoists for hand or motor operation. Also flap and mud valves, shear and filler gates, trash racks and rakes. Dependable canal equipment from dam to tail-race since 1840.
Write for Special Catalog Today!
RODNEY HUNT
RODNEY HUNT MACHINE CO.
118 Lake St., Orange, Mass., U. S. A.

Engineered Protection against Overflow in Tanks Overpipes or Reservoirs

GOLDEN-ANDERSON
Semi-Throttling
ALTITUDE VALVES
Golden-Anderson semi-throttling valves are completely self-contained—without any waste of water from above valve piston and are especially desirable for service where a low head is to be maintained against a higher influent pressure.
Descriptive technical bulletin on request.
GA
GOLDEN-ANDERSON
VALVE Specialty Company
FULTON BUILDING • PITTSBURGH 22, PA

FINE SCREENS
FOR
SEWAGE TREATMENT

ADVANCED DESIGN
AND CONSTRUCTION
COMPLETE INSTALLATIONS

THE NEW
M. T.
SCREEN
PLATE



ROLLED OR EXTRUDED
AT THE MILL IN STAINLESS
STEEL OR "EVERDUR"
HIGHER STRENGTH
HIGHER EFFICIENCY
LOWER COST AND UPKEEP

M. T. SCREENS IN LARGER SIZES FOR WATER FILTER BEDS—NO LARGER SIZES OF GRAVEL OR OTHER FILTER MATERIAL REQUIRED—CLEANING AND BACK-WASHING SIMPLIFIED.

SANEQUIPMENT ENGINEERING
2843 WHITEWOOD AVE.
ANN ARBOR, MICHIGAN

WRITE FOR INFORMATION

VOGT BROTHERS
TRAFFIC MODEL
FIRE HYDRANT

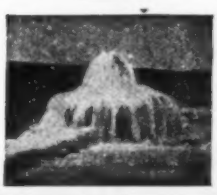
A.W.W.A.

VOGT BROTHERS MFG. CO.
Incorporated
LOUISVILLE, KY.
MAIN AT 14th
VOGT
VOGT MFG. CO., Incorporated
P. O. BOX 1122
LOUISVILLE, KY.

AERO-MIX

AERATOR—
MIXER

A Size and Type to Fit Your Problem in Water or Sewage Treatment.



WRITE FOR INFORMATION

The Cast Iron Pipe News may be obtained from the Cast Iron Pipe Research Association, Peoples Gas Building, Chicago 3, Ill.

* * *

Issued by Drinkwater, Inc., 2323 S. Michigan, Chicago 13, Ill., a new four page bulletin titled **Drinkwater Prestolock Flexible Pipe Couplings** points out the many applications of these couplings, graphically illustrates the simplicity of the coupling parts, and gives complete engineering data, drawings and specifications on the 11 sizes from 1¼ in. to 16 in. If you think you might find a use for these new couplings, write for the bulletin.

* * *

"Bitumastic Scores Again With Sewage Engineers," according to Issue No. 39 of the **Bitumastic Bulletin** published by the Wailes Dove-Hermiston Co. This particular issue tells about how Wm. D. "Bill" Denise of the Sewage Treatment Plant of Greece, N. Y., found Bitumastic 50 to be an effective corrosion protection in underwater locations such as channel cover supports, ferric chloride tanks, and sludge mixing tanks. In above water applications where only the weather is a factor, Bitumastic Black gives satisfactory protection, according to Mr. Denise, who uses Wailes Dove-Hermiston Hi-Heat Gray on his incinerator with equally satisfactory results.

This same issue of the folder contains a story of Bitumastic coatings on the giant Denison Dam at Denison, Tex. These folders, which are issued regularly and which contain, in addition to new stories, a chart of What To Put On What, and when, may be obtained by writing Wailes Dove-Hermiston Corp., Westfield, N. J.

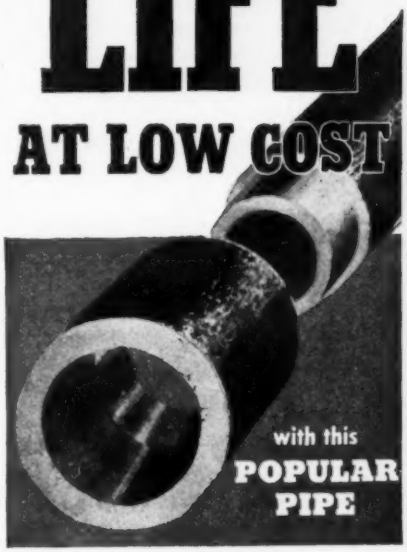
* * *

It's small, but this eight page folder of pocket size, on **Baldwin-Rex Roller Chain Belts**, distributed by the Baldwin-Duckworth Div. of The Chain Belt Co., contains a complete description of the roller chain features. Also included is a table of specifications, sizes, and list prices. A copy of the folder may be obtained by writing for Bull. No. 45-1 from Baldwin-Duckworth Div. of The Chain Belt Co., Springfield 2, Mass.

* * *

As a means of combating the destructive effects of corrosion, Cochrane Corp., of Philadelphia 32, Pa.,

LONG
LIFE
AT LOW COST



Hundreds of progressive communities are using ORANGEBURG PIPE because it assures long, trouble-free service, is easy to handle and install, does not corrode or tuberculate, is connected with TAPERWELD Joints which require no joining compound, and offers many other superior features. This modern non-metallic, non-rigid pipe is widely and successfully used for

- House-to-Sewer Connections
- Conductor and Irrigation Lines
- Industrial Drainage
- Septic Tank Filter Beds (Perforated)
- Foundation Drains (Perforated)

Write for bulletins giving physical and chemical characteristics and other interesting data. THE FIBRE CONDUIT COMPANY, DEPT. WWS-10-45, ORANGEBURG, N. Y.

ORANGEBURG
The Root-Proof Pipe

HYDRO-TITE

HYDRO-TITE — The self-caulking joint compound that makes cast iron water pipe joints — strong — tight — flexible and everlasting. Used on thousands of miles of pipe with a record of more than 30 years without a failure.

•

FIBREX — The sanitary paper packing that is used like braided jute. Free from bacteria — treated with a water repellent — put up in 60 pound reels. 70 pounds of Fibrex takes the place of 100 pounds of braided jute.

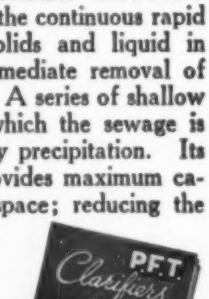
•

HYDRAULIC DEVELOPMENT CORPORATION
50 Church St.
New York, N. Y.

DRY BRAIDED
Fibrex

P.F.T. Clarifiers for Rapid Precipitation of Sewage Solids

The P.F.T. Tray Clarifier embodies a design which affects the continuous rapid separation of the solids and liquid in sewage; and the immediate removal of the clarified effluent. A series of shallow settling areas over which the sewage is spread assures speedy precipitation. Its high rate of flow provides maximum capacity in minimum space; reducing the construction and operating costs of clarification equipment.



Write for Bulletin No. 210 containing complete information, including operating results.

P.F.T. Pacific Flush-Tank Company
4241 Ravenswood Ave., Chicago, Ill.
New York Charlotte, N. C

have developed a deaerator for the purpose of removing oxygen and carbon dioxide from process waters. What makes this deaerator unique is the fact that it works on *cold* water. It is thoroughly described in Cochrane Reprint No. 43, titled **Cold Water Deaeration,** which may be obtained by writing to the company.

* * *

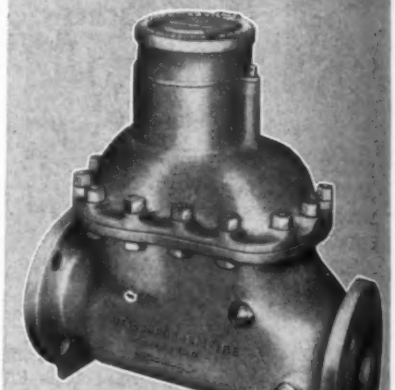
Under the trade mark "Eclipse" the John C. Kupferle Foundry Co. of St. Louis, Mo., has manufactured Yard, Fire and Wall Hydrants and Street Washers since 1857. The company also manufactures the Corn King hydrant and the Improved Kupferle Fire Hydrant. These various items and all of the parts therefor are illustrated and listed with complete specifications in **Catalog 30 A,** issued in filing form by the John C. Kupferle Foundry Co., First and Wright Sts., St. Louis 7, Mo.

* * *

When you begin to plan or repair chemical tanks, towers, floors, ducts, sewers, don't forget **Materials of Chemical Construction,** including acidproof cements, plastic linings, jointing materials, and protective coatings as manufactured by the Atlas Mineral Products Co., Mertztown, Pa. A catalog titled with the above name may be had by writing the company. Pictured and described in this catalog are cements, plastic linings, jointings, and protective coatings for acid and alkali proof industrial construction, etc., and for jointing C.I. water main and sewer pipe. Listed and shown in application illustrations are Tegul Vitrobond, Carbo-Vitrobond, Korez, Carbo-korez, Alkor, Vitrex, Tegul Tileset, Atlastic, Atlas Acidproof brick, Rewbon, Neobon, Zerok, Atlastiseal, Tegul Mineralead, G-K Sewer Joint Compound and Amolok, among other products.

Now all of these products, with or without the odd names, have specific uses and almost all, if not all, will find some use in water and sewage plants. Of course, you are all familiar with the jointing of C.I. pipe and of vitrified tile sewers, but you might do well to write to Atlas Mineral Products Co., Mertztown, Pa., for this catalog and find out the variety of other products which will have applications in your plant, particularly if you have a smokestack, chemical tanks, tile or concrete floors, or if you want to protect steel or concrete surfaces against corrosion.

Have you seen?
the PITTSBURGH · EMPIRE COMPOUND
a revolutionary **NEW** meter with many advantages



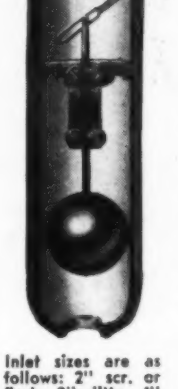
PATENT APPLICATION MADE

Ask for Bulletin W-803

PITTSBURGH EQUITABLE METER CO.
Pittsburgh 8, Pa.

CRISPIN SEWER VALVES

A NEW Pressure Air Release Valve for Sewer Lines



Designed by Crispin, a well-known name in Air Valves for Water Works systems, this new Valve for sewer lines will automatically relieve accumulating air and gases from force mains and other sewage equipment. It is suitable for all pressures up to and including 175 lbs. per square inch.

Outstanding features of the design permit a tight air seal at the top, with the float, actuating the levers, well away from working parts, thereby preventing sludge and other foreign matter from clogging the working parts. The ball rod runs through rollers permitting free action of the float without undue friction.

Inlet sizes are as follows: 2" scr. or flgd., 3" ditto, 4" ditto, 6" flgd. only.

FOR INFORMATION WRITE

MULTIPLEX MFG. CO.
BERWICK, PA.

Not too many weeks ago, a man from the Crane Co. called to say they were producing an anniversary issue of *The Crane Valve World*, showing **90 Years of Progress** of Crane products. He was interested in photographs that would be symbolic of the water and sewage works industry. Naturally, when the July-August issue came to our desk recently we were anxious to see how the subject of water and sewage treatment had been handled.

Under the heading, "Waterworks and Sewerage Systems—Protectors of the Nation's Health," the editor has given a lucid commentary on the growth of water and sewage treatment in the U. S. in 90 years. Symbolic of the old days is a wooden water tank, while a huge Crane valve in a water plant and an aerial view of a large sewage plant represent today's achievements.

The book is truly a "special issue to record progress of industry through 90 years of war and peace and the part that Crane Co. products have played in it." In addition to the discussion of water and sewage treatment, there are sections devoted to Power, Petroleum, Steelmaking, Pulp and Paper, Chemical Processing, Railroads, Gas, Textiles, Canning and Bottling, Rubber, Shipbuilding, Meat Packing and Dairying, Plastics, Mining, Building Construction, and Machinery.

A copy of this interesting booklet may be obtained by writing for the July-August issue of *The Crane Valve World*. Address your requests to Crane Co., 836 Michigan Ave., Chicago 5, Ill.

* * *

On page 120 of the Ref. and Data Section of the June 1944 issue of *Water Works and Sewerage* appeared an article showing the installation of electric heaters to solve a heating problem in a chemical storage room. Well, sir, we had an inquiry from a reader about how to figure sizes, costs, etc., of an installation like that. Of course, we turned the inquiry over to the manufacturer, the General Electric Co., Schenectady, N. Y., who sent us a copy of **Electric Heat in Industry**, which featured the same story as contained in our article. G. E. also suggested that information on costs, sizes, etc., could be obtained from tables in the back of **Catalog GED-650-B**, which may also be obtained from the General Electric Co., Schenectady, N. Y.

for CONCRETE and STEEL!

Inertol Protection Means Lowest Cost Per Year

INERTOL COMPANY, INC. NEWARK 5, NEW JERSEY and SAN FRANCISCO 7, CALIFORNIA

for YOUR Main Lines

SPARLING METERS

Easily installed on main lines already in place or on new ones, to Totalize flows by Direct Action. Flow Indicators, Recorders and Controls can be added as desired.

Bulletin No. 308 comes upon request

SPARLING *Manufacturer of Water Measuring Equipment*

LOS ANGELES 54, Box 3277, Terminal Annex — 622 Broadway.....CINCINNATI 2
CHICAGO 16.....3104 South Michigan Ave. — 101 Park Avenue.....NEW YORK 17
BOSTON 8.....6 Beacon Street

AMERICAN-Standard GAS BOILERS

STEAM AND WATER TYPES

FOR DIGESTER HEATING

SEE DATA PAGE IN ANNUAL REFERENCE SECTION

AMERICAN-Standard

HEATING PLUMBING

Serving the Nations' Health and Comfort

American Radiator & Standard Sanitary Corporation, Pittsburgh 30, Pa.

SALES OFFICES IN ALL PRINCIPAL CITIES

MECHANICAL EQUIPMENT BY ROBERTS FILTER MFG. CO. DARBY, PENNA.

KNOWN AROUND THE WORLD AS THE SIGN OF EXCELLENCE IN WATER TREATMENT EQUIPMENT

The years of experience behind the Roberts nameplate is your assurance that any water rectification problem is expertly handled to your best advantage. As manufacturing and installation engineers, the Roberts organization is equipped to meet your exact needs regardless of the size of the equipment or the complexity of the problem.

GRAVITY FILTERS • SOFTENING PLANTS AND EQUIPMENT • PRESSURE FILTERS ZEOLITE SOFTENERS • SWIMMING POOL RECIRCULATING APPARATUS SPECIAL WATER TREATMENT EQUIPMENT

We invite your inquiries

ROBERTS FILTER MANUFACTURING COMPANY • *Darby, Pa.*

WANTED –
Sales Minded
ENGINEER

. . . who can qualify by reciprocity or test, or who is registered in State of Oregon, to act as Sales Technician for firm selling Sewage Pumps and Pumps for Pulp and Paper Mills. Old established company distributing fine line of equipment. Opportunity to develop this division of their pump department and later head as sales manager. Knowledge of Pulp and Paper Industry and Sewage desirable, but not essential. Give age, education, experience, engineering record. Enclose picture.

R. M. WADE & CO.
106 S.E. Hawthorne Blvd.
Portland 14, Ore.

IMPROVED JOINTING COMPOUND
Tegul-MINERALEAD
for Bell & Spigot Main

- Sulphur base; quick sealing, speeding laying and backfilling.
- 10 lb. ingot form, easily handled, stored and shipped. Impervious to rain. Cannot change composition.
- Makes permanently tight joints. Goes 3 to 5 times as far as lead, helping conserve a strategic war metal.
- For money-saving information, write

The ATLAS MINERAL Products Company of Pa.
Mertztown Pennsylvania

ZECO GREENSAND ZEOLITE

ZECO and HI-ZECO Greensand Zeolite for water softening, filtration and iron removal. ZECO Manganese Zeolite for iron and manganese removal. COREXITE mineral for corrosion control and water stabilization.

ZEOLITE CHEMICAL CO.
Sales Office: 140 Cedar St., New York, N. Y.
Factory: Medford, N. J.
Pioneer Producer of GREENSAND ZEOLITE MINERAL

Each time we have received a new edition of **Orangeburg Pipe** we have found it larger than the last and more informative as well. This latest edition of Catalog No. 304, which may be obtained by writing the Fibre Conduit Co., Orangeburg, N. Y., contains 20 pages of useful information that engineers and operators of water and sewage plants may well find helpful.

For example, this pipe, which is a homogeneous structure of fibres, impregnated with coal tar pitch under pressure, has shown a long and trouble free life as sewer pipe, house service connections, industrial waste sewers, underground protective coatings for other conduits, downspouts, weep holes, and ranch and farm gravity water supply.

The catalog gives laying instructions for this pipe, which is light in weight, may be sawed to any length, jointed to other pipes, and taper jointed to prevent root growth, as well as presenting general properties and characteristics and a chart showing the hydraulic capacity of Orangeburg Pipe. Data and diagrams are also included on jointing, adapters, couplings, and angle laying. And lastly, the catalog contains a list of Don'ts that will save some headaches in using this type of pipe.

POSITION WANTED

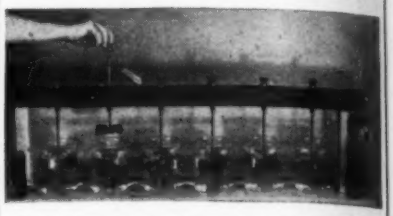
ENGINEER (Design and Construction)—Graduate C.E. (Cornell), experienced not alone in sanitary engineering, but also in general engineering and especially building, design and construction. Conn. registrant and resident, prefers East but will consider moving to South or Southwest. Address H.F.P., c/o Water Works & Sewerage, 155 East 44th Street, New York 17, N. Y.

POSITION WANTED—In sewage disposal works or filtration plant. Have had 2 years' experience in former and 8 months in latter. Box 1090, Water Works & Sewerage, 330 So. Wells St., Chicago 6, Illinois.

POSITION WANTED

ENGINEER presently employed, desires immediate connection—preferably in Texas or Southwest—affording permanence and opportunity. Willing to travel. Experienced in Water Works, Sewerage Disposal, and general plant layout, design and construction; cost estimating; thorough knowledge of materials and equipment and purchasing; general development and statistical research. Available on two weeks' notice. Details and references on request. Address Water Works & Sewerage, Box 1080, 330 So. Wells Street, Chicago 6, Ill.

THE *Phipps & Bird* LABORATORY MIXER . . .



IS the important piece of equipment in the Modern Water Works Laboratory. Now being used by leaders in water works research. Many superintendents and chemists have been able to reduce their chemical costs by the control of chemical dosages with this mixer. Write for literature.

PHIPPS & BIRD, INC. Richmond, Va.

TAPAX

***The* ORIGINAL *and* FINEST . . . .**

Manhole Cushion U. S. Pat. No. 2,050,050 offers you the simplest solution for noisy, rattling covers. Easy to install. Lasting — Economical.

Write for story of Tapax and Trial Offer.

TAPAX MFG. CO., INC.
MAMARONECK NEW YORK

SAVE MONEY USE ACTIVATED ALUM and BLACKALUM

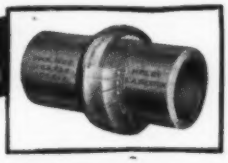
STUART-BRUMLEY CORP.
516 North Charles St.
Baltimore Maryland

WANTED

Manufacturers of Water Works and Municipal Supplies who are looking for efficient Manufacturers' Agent to represent them in New York and New Jersey. 15 years' experience and wide acquaintance among Water Works and Municipal Officials will bring you results. Send full details to

Box 1070, Water Works & Sewerage, 155 East 44th St., New York 17, N. Y.

ANTHRAFILT
A Filter Medium For All Purposes
ANTHRACITE EQUIPMENT CORP.
101 Park Ave. New York
C. E. PALMER
Engineer and Sales Representative
822 E. 8th STREET, ERIE, PA.

WESTON

GASKET AND FORM
The Perfected Method for Making Sewer Pipe Joints of Cement
- No jute used—gasket centers spigot.
- Definite space in each joint for cement.
- Form confines cement-grout to lower portion of joint.
- Particularly advantageous in water-bearing trenches.
- Infiltration minimized.

L. A. WESTON Adams, Mass.

..for ACCURACY and TROUBLE-FREE OPERATION
INSIST ON THE WILSON HYPO-CHLORINATOR

Engineered and Manufactured by
WILSON
CHEMICAL FEEDERS, INC.
203 CLINTON STREET BUFFALO 4, N. Y.

According to the Foreword, "the purpose of **Filtros, the Porous Mineral Medium**, booklet is threefold": to introduce Filtros to persons unacquainted therewith, to impart more detailed information to those who know the material, and to present information and suggestions to those interested in particular grades for special purposes, etc.

To accomplish these purposes, the 31 page booklet contains a general description of Filtros, a section on physical properties, a section on chemical properties, as well as sections on shapes, sizes, grades, uses, and care of Filtros. This very informative booklet may be had by writing to Filtros, Incorporated, East Rochester, N. Y., and if you ever contemplate the use of porous media you should write for it.

* * *

Self-lubricating, non-gumming, chemically inert, quiet operation, corrosion proof, non-warping, self-lapping, controlled porosity, highly machineable, light weight, minimum expansion, molds to close limits, can be superfinished, long service life, non-scoring, and extremely low cost. What is it? That's **Morganite Liquid Meter Valves and Slides** as described in a folder of that name issued by the Morganite Brush Co., Inc., Long Island City 1, N. Y. This Morganite material is basically a natural graphite, petroleum coke, lamp black, and retort carbon, combined with pitches, tars and other binders, with the proportion of each carefully controlled for specific results. Metals may be added for special qualities. We know about the self-lubricating characteristics of bearings made out of Morganite, too, but this is the first folder we've seen on the use of the material for meter slides and valves. If you are interested, write for the folder and further information.

* * *

From the pictures in **Bulletin 2300** of the Cement Gun Co., Allentown, Pa., it appears that one may use "Gunite" for just about anything—walls of pumping stations, fences, residences, capitol domes, bleacher seats, cageless zoos, municipal band shells, roofs, swimming pools, repairing concrete water tanks, bridges, culverts, dams, sewers, clarifiers, etc., etc., etc.

As everyone knows, Gunite is the trade name for the dense concrete surfacing applied with the Cement Gun to almost any surface. One of the most interesting applications within the past two years is the construction of pre-stressed "Gunite" water tanks. The story of these tanks at Schuylkill Haven, Pa., was told in *Water Works and Sewerage* by the designer, I. M. Glace, of Harrisburg.

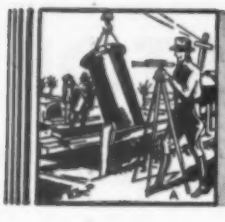
If you have a problem of a cracked concrete surface or are interested in resurfacing floors, walls, tanks, dams, sewers and the like, by all means write to Cement Gun Co., Allentown, Pa. for this 72-page **Bulletin 2300.**

STOP JOINT LEAKAGE WITH CARSON CLAMPS
AND MECHANICAL JOINTS
Charcoal iron bolts for Cast Iron Pipe and Fittings.
Write for Prices.
Carson-Cadillac Co.
1221 PINSON ST. BIRMINGHAM, ALA.

SAVE with TENNESSEE CORPORATION ferri-floc FERRIC SULPHATE
Write today for actual case histories of plants now using the ideal ferric coagulant.
TENNESSEE CORPORATION
Atlanta, Georgia Lockland, Ohio

EDSON
DIAPHRAGM PUMPS
Hand Sizes 2", 2½", 3", 4"
Power Sizes 3" and 4"
Open Discharge or Force Pump
Edson Special Suction Hose
Red Seal Diaphragms
Strainers and Foot Valves
Hose Spanners—Adapters
THE EDSON CORPORATION
Main Office and Works: 49 D St.
South Boston, Mass.
New York: 142 Ashland Pl., Brooklyn

If you're a user of Nordstrom lubricated plug valves, write to Merco Nordstrom Valve Co., 400 Lexington Ave., Pittsburgh, Pa., and ask for **Manual No. V-105, Rev. 6.** Featuring the uses of lubricants in lubricated plug valves, the manual gives complete instructions in application of valve lubricants and lists 40 types in stick and bulk form, including a silicone type. More than 100 specific valve services are included, with corresponding lubricant recommendations, for various conditions of line fluid, temperature and pressure.



Consulting Engineers

Specializing in the field of

WATER WORKS & SEWERAGE

ALBRIGHT & FRIEL, INC.

Consulting Engineers

Water, Sewage and Industrial Waste Problems — Airfields, Refuse Incinerators, Power Plants — Industrial Buildings
City Planning - Reports - Valuations

Laboratory

1520 Locust Street, Philadelphia 2

Alvord, Burdick & Howson

Engineers

Charles B. Burdick
Louis R. Howson
Donald H. Maxwell

Water Works, Water Purification, Flood Relief, Sewerage, Sewage Disposal, Drainage, Appraisals, Power Generation

Civic Opera Building — Chicago

Michael Baker, Jr.

The Baker Engineers

CIVIL ENGINEERS AND PLANNERS
MUNICIPAL ENGINEERS

Airport Design—Sewage Disposal Systems
Water Works Design and Operation
Consulting Services - Surveys and Maps

HOME OFFICE—ROCHESTER, PA.

Black & Veatch

Consulting Engineers

4706 Broadway, Kansas City, Mo.

Sewerage, Sewage Disposal, Water Supply, Water Purification, Electric Lighting, Power Plants, Valuations, Special Investigations, Reports and Laboratory Service

E. B. Black — N. T. Veatch, Jr.
A. P. Learned — H. F. Lutz
F. M. Veatch — R. E. Lawrence
E. L. Filby — J. F. Brown

BOGERT-CHILDS ENGINEERING ASSOCIATES

CONSULTING ENGINEERS

Clinton L. Bogert — Fred S. Childs
Howard J. Carlock — Arthur P. Ackerman
John M. M. Greig — Robert J. McCarthy

Water Supply and Purification
Sewerage and Sewage Treatment
Flood Control and Drainage
Refuse Disposal
City Planning—Investigations—Reports

624 Madison Avenue, New York 22, N. Y.

Buck, Seifert and Jost

Consulting Engineers

(Formerly Nicholas S. Hill Associates)

Water Supply, Sewage Disposal, Hydraulic Developments, Reports, Investigations, Valuations, Rates, Design Construction Operation, Management, Chemical and Biological Laboratories

112 East 19th St. — New York

Burns & McDonnell

Engineering Co.

McDONNELL-SMITH-BALDWIN-TIMANUS-McDONNELL

Consulting Engineers Since 1897

Waterworks, Light and Power, Sewerage, Reports, Designs, Appraisals, Rate Investigations

Kansas City, Mo., 107 West Linwood Blvd.

THOMAS R. CAMP

Consulting Engineer

6 Beacon Street, Boston 8, Mass.

Water Works and Water Treatment; Sewerage and Sewage Treatment; Municipal and Industrial Wastes; Investigations and Reports; Design and Supervision; Research and Development; Flood Control.

The Chester Engineers

Campbell, Davis & Bankson

Water Supply and Purification, Sewerage and Sewage Treatment, Power Development and Applications, Investigations and Reports, Valuations and Rates.

210 E. Park Way at Sandusky, Pittsburgh 12, Pa.

Collins Engineering Company

—Consulting Engineers—

Water Supply, Purification, Sewerage, Sewage Treatment, Refuse Disposal, Industrial Wastes, Street Paving, Storm Drainage

326 Arnote Building — 314 Gilbert Building
McAlester, Oklahoma — Ardmore, Oklahoma

DE LEUW, CATHER & COMPANY

Water Supply — Sewerage
Railroads — Highways
Grade Separations—Bridges—Subways
Local Transportation

Investigations — Reports — Appraisals
Plans and Supervision of Construction

20 North Wacker Drive — Chicago

FAY, SPOFFORD & THORNDIKE

Engineers

Charles M. Spofford
John Ayer — Carroll A. Farwell
Bion A. Bowman — Ralph W. Horne

Water Supply and Distribution — Drainage
Sewerage and Sewage Treatment—Airports
Investigations and Reports
Designs — Valuations
Supervision of Construction

Boston — New York

BUY MORE VICTORY BONDS

GANNETT FLEMING CORDDRY AND CARPENTER, INC.

Harrisburg, Pa. — New York, N. Y.

ENGINEERS

Water Works, Sewage, Industrial Wastes & Garbage Disposal—Roads, Airports, Bridges & Flood Control. Town Planning, Appraisals, Investigations & Reports.

I. M. Glace

Consulting Sanitary Engineer

WATER SUPPLY AND PURIFICATION
SEWERAGE AND SEWAGE TREATMENT

Specializing in Water Quality Problems

Telephone 6-0407 — 1001 North Front St. Harrisburg, Pa.

Greeley and Hansen

Engineers

Samuel A. Greeley — Paul Hansen
Paul E. Langdon — Kenneth V. Hill
Thomas M. Niles — Samuel M. Clarke

Water Supply, Water Purification, Sewerage, Sewage Treatment, Flood Control, Drainage, Refuse Disposal

6 N. Michigan Ave., Chicago

Havens and Emerson

W. L. Havens — C. A. Emerson
A. A. Burger — F. C. Tolles — F. W. Jones

Consulting Engineers

Water, Sewage, Garbage, Industrial Wastes, Valuations — Laboratories

Leader Building, Cleveland 14 — Woolworth Bldg. New York 7

Hayden, Harding & Buchanan

Consulting Engineers

John L. Hayden — Gordon E. MacNeill
John H. Harding — Oscar J. Campia

Waterworks, Sewerage, Civil, Mechanical, Electrical, Structural

662 Park Square Building, Boston, Mass.

Charles Haydock

Consulting Engineer

Water Works and Sanitation, Industrial Wastes, Design, Construction, Operation and Management. Reports and Valuations.

COMMERCIAL TRUST BUILDING
PHILADELPHIA 2

JONES & HENRY

Formerly H. P. JONES & CO.

Harvey P. Jones — Thomas B. Henry

Consulting Engineers

Reports, Designs, Supervision, Valuation

Water Supply — Refuse Disposal
Water Purification — Industrial Wastes
Sewerage — Flood Control
Sewage Treatment — Drainage

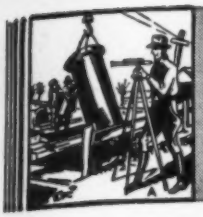
606 Toledo Trust Bldg. — Toledo 4, Ohio

Morris Knowles, Inc.

Engineers

Water Supply and Purification, Sewerage and Sewage Disposal, Valuations, Laboratory, City Planning

1312 Park Building, Pittsburgh, Pa.



Consulting Engineers

Specializing in the field of

WATER WORKS & SEWERAGE

Wm. S. Lozier, Inc.

Consulting Engineers

Wm. S. Lozier - C. E. Elmdorf - A. B. Squire
Sewerage, Sewage Disposal, Water Supply, Water Purification, Refuse Disposal

10 Gibbs Street, Rochester, N. Y.

Metcalf & Eddy

Engineers

Water, Sewage, Drainage, Refuse and Industrial Waste Problems
Airfields Valuations
Laboratory

Statler Building, Boston

MURRAY LABORATORY

25 years experience

Consulting—Analytical—Chemist—Bacteriologist. Municipal and Industrial Water Supplies

Bacteriological — Chemical — Sanitary — Mineral Analyses. Reports and Treatment Recommendations.

Capers Bldg.—Greenville, South Carolina

Nussbaumer and Clarke

Newell L. Nussbaumer **Irving Clarke**

Water Supply and Treatment
Sewerage & Sewage Disposal
Garbage Incineration
Town Planning

327 Franklin St. **Buffalo, N. Y.**

Parsons, Brinckerhoff, Hogan & Macdonald

Formerly: Parsons, Klapp, Brinckerhoff & Douglas

Engineers

Traffic Reports Valuations Harbor Works
Power Developments Industrial Buildings
Bridges Tunnels Subways Foundations
Dams Water Works Sewerage

142 Maiden Lane, New York 7
Calle Sur 17 No. 27, Caracas, Venezuela
Avenida Presidente Wilson 164, Rio de Janeiro, Brazil

Malcolm Pirnie

Engineers

Water Supply, Treatment, Sewerage
Reports, Plans, Estimates
Supervision and Operation
Valuation and Rates

25 W. 43rd St., New York, N. Y.

The Pitometer Company

Engineers

Water Waste Surveys, Trunk Main Surveys, Water Distribution Studies

Penstock Gaugings
New York, 40 Church St.

ROBERT T. REGESTER

Consulting Engineer

Sewerage—Sewage Treatment
Water Works—Industrial Wastes
Flood Control—Fire Protection

Advisory Service, Reports and Designs

Baltimore Life Building
Baltimore, Md.

Thomas M. Riddick

Consulting Engineer and Chemist

Municipal and Industrial Water Purification, Sewage Treatment, Operating Supervision of Plants, Sanitary Surveys, Stream Pollution Investigation, Swimming Pool Control, Chemical and Bacteriological Analyses, Testing of Materials.

369 East 149th Street, New York City

ROBERT AND COMPANY

Incorporated

Architects and Engineers

ATLANTA, GEORGIA

Water Supply Incinerators
Sewage Disposal Power Plants

Russell & Axon

Geo. S. Russell—John C. Pritchard
Joe Williamson, Jr. — F. E. Wenger

Consulting Engineers, Inc.

Sewerage, Sewage Disposal, Water Works, Filtration, Softening
Power Plants

6635 Delmar Blvd University City 5, Mo.

J. E. Sirrine & Company

Engineers

Water Supply & Purification
Sewage & Industrial Waste Disposal
Stream Pollution Reports
Utilities, Analyses

Greenville **South Carolina**

Benjamin L. Smith & Associates

Engineers

(Formerly Whitman and Smith)

Investigations — Reports
Designs — Supervision — Valuations
Municipal Engineering and Public Utilities

11 North Pearl Street
Albany 7, New York

STANLEY ENGINEERING COMPANY *Consulting Engineers*

Water Works — Sewerage
Electric Power — Flood Control
Rate Studies—Valuations—Industrial
Airports . . . Municipal Buildings

Hershey Bldg., Muscatine, Ia.

PHILIP B. STREANDER AND AFFILIATES

CONSULTING SANITARY ENGINEERS

Damon and Foster, Engrs.
Sharon Hill, Del. Co., Pa.

Cleverdon, Varney & Pike, Engrs.
120 Tremont St., Boston 8, Mass.

Water Supply, Treatment, Distribution
Trade Wastes, Refuse Disposal
Sewerage, Sewage Treatment
Plans, Supervision, Reports

Westcott & Mapes, Inc.

Architects and Engineers

Sewage Disposal
Garbage and Refuse Incineration
Public Utilities
Reports Plans Specifications

NEW HAVEN **CONN.**

Weston & Sampson

Water Supply, Water Purification, Sewerage, Sewage and Industrial Waste Treatment, Corrosion Control, Laboratory Service, Supervision, Valuations

14 Beacon St. **Boston, Mass.**

Whitman & Howard

Engineers (Est. 1869—Inc. 1924)

Channing Howard Paul F. Howard
Walter A. Janvrin C. Roger Pearson

Water Supply, Water Purification, Sewerage, Sewage Disposal, Water Front Improvements and all Municipal and Industrial Development Problems, Investigations, Reports, Designs, Supervision, Valuations.

89 Broad St., Boston, Mass.

WHITMAN, REQUARDT AND ASSOCIATES

Engineers — Consultants

Civil—Sanitary—Structural—Mechanical—Electrical. Reports, Plans, Supervision, Appraisals

1304 St. Paul Street
Baltimore 2, Maryland

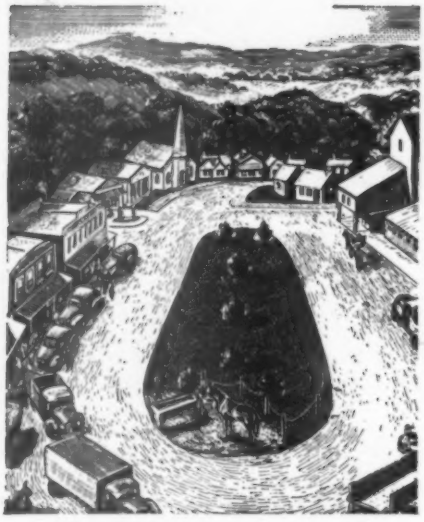
WANTED, BACK ISSUES

of

WATER WORKS & SEWERAGE

If you have back copies of the following issues which you are willing to part with, we will allow you an extension on your subscription for each one returned to us. March, 1945—July, 1944—March, 1944 October, 1944.

Write to Subscription Department
WATER WORKS & SEWERAGE
330 South Wells St., Chicago 6, Ill.



"Centerville" Is Putting In a LAYNE WATER SYSTEM

"Centervilles" throughout the nation are rapidly graduating from town-pump villages. Their growth and stability as cities of lovely homes, fine business houses and progressive citizens has called for the installation of a modern water system. Officials of "Centerville" are beginning right—taking no chances on water supply failure—expensive operation, or short life of wells and pumps. They are putting in a Layne Well Water System. Investigation has shown "Centerville's" officials that a Layne Well Water System is easily within their means and is a sound and profitable investment.

These same kind of Layne Well Water Systems and Layne Vertical Turbine Pumps are serving the nation's largest cities—the greatest industries, biggest railroads, and the most extensive irrigation projects. Layne water producing equipment enjoys the reputation of being the world's best—and that reputation is constantly growing stronger and stronger.

Layne offers fine and always dependable Well Water System counsel with no obligation. For further facts, catalogs, etc., address Layne & Bowler, Inc., General Offices, Memphis 8, Tenn.

HIGHEST EFFICIENCY

Layne Vertical Turbine Pumps are now available in sizes to produce from 40 to 16,000 gallons of water per minute. Their high efficiency saves hundreds of dollars on power cost per year.

AFFILIATED COMPANIES: Layne-Arkansas Co., Stuttgart, Ark. * Layne-Atlantic Co., Norfolk, Va. * Layne-Central Co., Memphis, Tenn. * Layne-Northern Co., Mishawaka, Ind. * Layne-Louisiana Co., Lake Charles, La. * Louisiana Well Co., Monroe, La. * Layne-New York Co., New York City * Layne-Northwest Co., Milwaukee, Wis. * Layne-Ohio Co., Columbus, Ohio * Layne-Texas Co., Houston, Texas * Layne-Western Co., Kansas City, Mo. * Layne-Western Co. of Minnesota, Minneapolis, Minn. * International Water Supply Ltd., London, Ontario, Canada * Layne-Hispano Americana, S. A., Mexico, D. F.

LAYNE

WELL WATER SYSTEMS
VERTICAL TURBINE PUMPS

Index TO ADVERTISERS

Albright & Friel, Inc. 136
Allen Billmyre Co. 113
Aluminum Co. of Amer. 41
Alvord, Burdick & Howson 136
American Brass Co. 10
American Car & Foundry Co. 26
American Cast Iron Pipe Co. 94
American Radiator & Standard Sanitary 133
Anthracite Equipment Co. 135
Armco Drainage Products Assn. 14
*Atlas Mineral Products Co. of Pa., The 134
American Well Wks. 30

Badger Meter Mfg. Co. 5
*Bailey Meter Co. 106
Baker Jr., Michael 136
*Barrett, Haentjens & Co. 118
Black & Veatch 136
Bogert-Childs 136
Bridgeport Brass Co. 43
Buck, Seifert and Jost 136
Buffalo Gasolene Motor Co. 123
*Builders Iron Foundry 94
*Builders-Providence, Inc. 94
Burgess-Manning Co. 44
Burns & McDonnell 136
Byers Co., A. M. 35

*Calgon, Inc. 29
Camp, Thos. R. 136
*Carborundum Co., The 93
Carson Cadillac Co. 135
Carter Co., Ralph B. 110
Cast Iron Pipe Research Assn. 23
Cement Gun Co. 125
Centriline Corp. 45
Chain Belt Co. 100
Chemical Equipment Co. 124
Chester Engineers, The 136
*Chicago Bridge & Iron Co. 7
*Chicago Pump Company 3
Clayton Mfg. Co. 102
Collins Engineering Co. 136
Cooper-Bessemer Corp. 4

Darco Corp. 96
Dearborn Chemical 15
De Laval Steam Turbine Co. 32
DeLeuw, Cather & Co. 136
Diamond Alkali Company 11
Dorr Company, Inc., The ....Third Cover
Dow Chemical Co. 125
Dresser Mfg. Division 16-17

Eddy Valve Co. 124
Electric Fish Screen Co. 128
Edson Corporation, The 135
Electro Rust-Proofing Corp. 94

Fairbanks, Morse & Co. 12
Fay, Spifford & Thorndike 136
Fibrie Conduit Co. 131
Fisher Research Laboratory 126
*Flexible Sewer Rod Equipment Co. ..107
*Flexible Underground Pipe Cutting Co. 107
Food Machy. Corp. 18
Ford Meter Box Co. 121

Gannett, Fleming, Cordy & Carpenter, Inc. 136
General Chemical Co. 40
*General Paint Co. 98
General Electric 36-37
Glace, I. M. 136
*Golden-Anderson Valve Spec. Co. 130
Gorman-Rupp 20
Greeley & Hansen 136
Grinnell Co., Inc. 117

Havens & Emerson 136
Hayden, Harding & Buchanan 136
Haydock, Chas. 136
*Hill, Hubbell & Co. 98
Homelite Corp. 33
Hays Mfg. Co. 109
Hellige, Inc. 130
Hooker Electrochemical Co. 107
Hydranger Corp. 115
Hydraulic Development Corp. 132

Inertol Co. 133
*Industrial Chemical Sales 13
*Infilco, Incorporated 115
*Innis Speiden & Co. 103

*Jeffrey Mfg. Co., The 31
Johns-Manville 8-9-46
Jones & Henry 136
*Josam Mfg. Co. 115

Knowles, Inc., Morris 136

Layne and Bowler, Inc. 138
Leadite Company, The 130
Leupold & Stevens 96
Lock Joint Pipe Co. 21
Lozier, Inc., Wm. S. 137

*M & H Valve & Fittings Co. 113
Mathews Hydrants 104
Mathieson Alkali Wks. (Inc.) 6
Metcalf & Eddy 137
Moreland Chemical Co. 109
Morris Machine Co. 120
Mueller Co. 24
Multiplex Mfg. Co. 122
Murray Laboratory 137

National Clay Pipe Mfrs. Inc. 99
*National Water Main Clean. Co. 129
Neptune Meter Company 50
*Northrop & Co. 116
Norwood Engr. Co., The 112
Nussbaumer & Clarke, Inc. 137

Omega Machine Co. 127
(Division of Builders Iron Fdry.)

*Pacific Flush-Tank Company 132
Parsons, Brinckerhoff, Hogan & Macdonald 137
Peerless Pump Division 105
(Food Machy. Corp.)
*Pennsylvania Salt Mfg. Company .... Second Cover
*Permutit Co., The 103
Phelps Dodge Refining Corp. 115
Phipps & Bird, Inc. 134
*Philadelphia Quartz Co. 119
Pirnie, Malcolm 137
Pitometer Co., The 137
Pittsburgh Equitable Meter Company 132
Pittsburgh-Des Moines Steel Co. 27
*Pittsburgh Plate Glass Co. (Columbia Chemical Div.) 19
Porter Co., H. K. (Quimby Pump Div.) 111
Portland Cement Ass'n. 97
*Proportioneers, Inc. 44

Regester, Robt. T. 137
*Rensselaer Valve Co. 126
*Riddick, Thomas M. 137
Ridge Tool Co. 105
Robert & Co. 137
Roberts Filter Mfg. Co. 133
Rodney Hunt Mach. Co. 120
Roots-Connersville Blower Corp. 122
*Ross Valve Mfg. Co. 127
*Royer Fdry. & Mach. Corp. 47
Russell & Axon 137

Sanequipment Engineering 131
Simplex Valve & Meter Co. 42
Sirrine & Co., J. E. 137
Smith & Associates, Benj. L. 137
Smith Mfg. Co., The A. P. 28
Smith Co., S. Morgan 34
Solvay Sales Corp. 104
*Sparling, R. W. 133
Stacey Bros. Gas Constr. Co. 114
Stanley Engineering Co. 137
Streander, Philip B. 137
Stuart Brumley Co. 134

Tapax Mfg. Co., Inc. 134
Tate Pipe Linings, Inc. 128
Taylor & Co., W. A. 128
*Tennessee Corp. 135
Thomson Meter Company 50

U. S. Pipe & Fdry. Co. 39

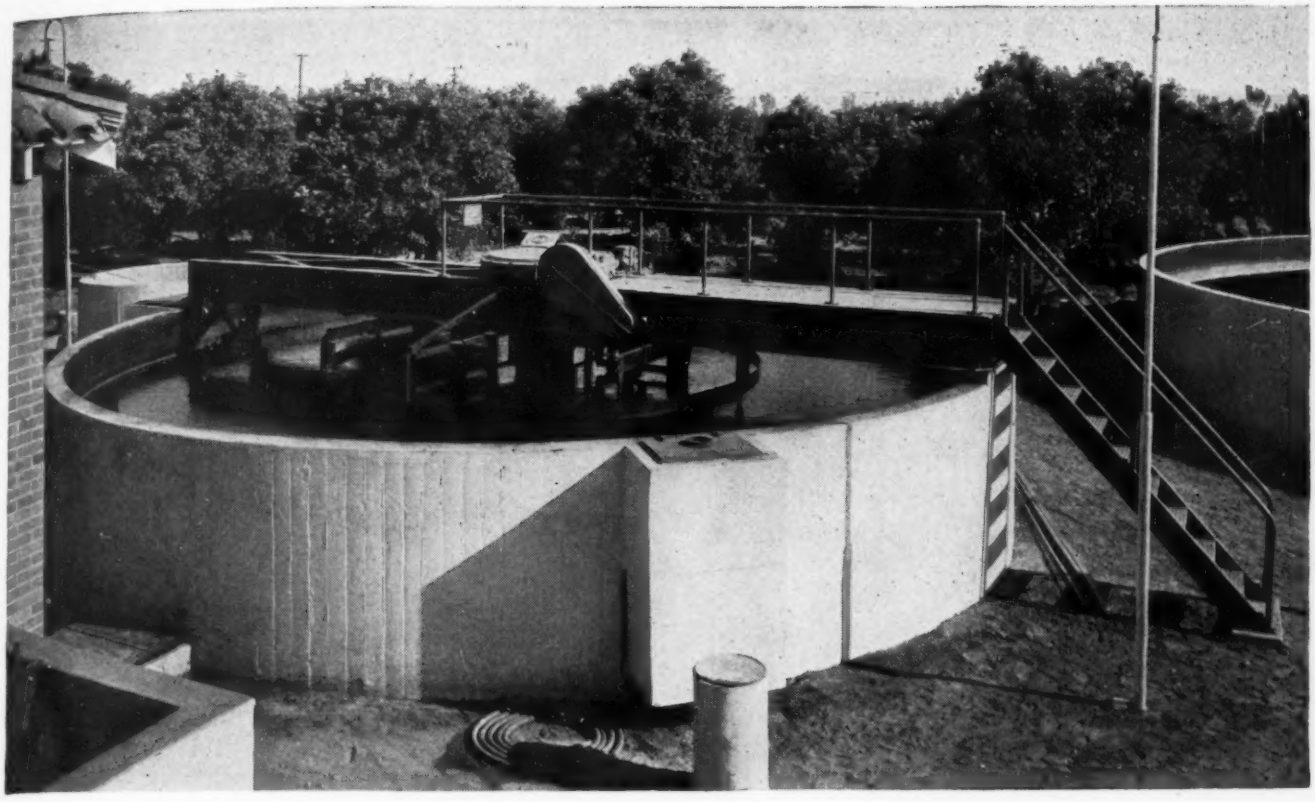
Victaulic Co. of America 101
Vogt Brothers Manufacturing Co. 131
Vogt Manufacturing Co. 131

Wade & Co., R. M. 134
*Wallace & Tiernan Co., Inc. ..Back Cover
Warren Foundry & Pipe Corp. 129
Wescott & Mapes, Inc. 137
Westinghouse Electric Corp. 25
Weston, L. A. 135
Weston & Sampson 137
Whitman & Howard 137
Whitman, Requardt & Associates 137
*Wilson Chemical Feeders, Inc. 135
Wood Co., R. D. 108
Worthington-Gamon Meter Co. 22
Worthington Pump & Machy. Corp. 38

Zeolite Chemical Co. 134

*Advertisers with * were represented in the June, 1945, Convention and Data Edition with catalog specification copy. Please refer to that issue for additional information on behalf of their products.

For Better Treatment of Turbid Water *in Less Space*



In a single, compact structure, the Dorrco Clariflocculator combines two essential steps in turbid water treatment—mechanical flocculation and continuous sedimentation. The volume and area provided in a Dorrco Clariflocculator are the same as for an individual clarifier in the same service—exclusive of the volume and area of the Flocculator which would also be required if separate tanks were used.

Heavy, dense flocs are formed in the central flocculation compartment of this Dorr combination unit, and pass gently into the outer sedimentation compartment *without disintegrating.* The Dorrco Clariflocculator is therefore particularly efficient where fragile flocs are formed or maximum removal desired. Taste-producing sludge is mechanically removed so rapidly that it does not have a chance to impair the quality of the treated water.

Have a Dorr engineer tell you what users report about the low *first cost* and low *operating cost* of the compact, efficient Dorrco Clariflocculator. For drawings, operating data, results of comparative tests, write for Clariflocculator Bulletin.

794

Blueprint Money

DORR

RESEARCH ENGINEERING EQUIPMENT

ADDRESS ALL INQUIRIES TO OUR NEAREST OFFICE

DORRCO

THE DORR COMPANY, ENGINEERS

NEW YORK 22, N.Y. . . 570 LEXINGTON AVE.
ATLANTA 3, GA. . . WILLIAM-OLIVER BLDG.
TORONTO 1, ONT. . . . 80 RICHMOND ST. W.
CHICAGO 1, ILL. . . . . 221 NO. LA SALLE ST.
DENVER 2, COLO. . . . . COOPER BUILDING
LOS ANGELES 14, CAL. . . . 811 WEST 7TH ST.

RESEARCH AND TESTING LABORATORIES
WESTPORT, CONN.

SUGAR PROCESSING
PETREE & DORR DIVISION
570 LEXINGTON AVE., NEW YORK 22, N.Y.

all around the town!

A perfect record—the elimination of *all* gas forming bacteria — becomes possible when adequate *free available chlorine residuals* are carried throughout the system. Such protection "all around the town" is most readily achieved through the use of Break-Point Chlorination — pioneered by Wallace & Tiernan and developed in practical operation by progressive waterworks with the technical advice and guidance of Wallace & Tiernan's nationwide field service organization.

For further details on the role of *free available chlorine residuals* in your plant call on your Wallace & Tiernan Representative and *write* for a copy of "Bacteriological Improvements Obtained by the Practice of Break-Point Chlorination."

WALLACE & TIERNAN COMPANY, INC.

Manufacturers of Chlorine and Ammonia Control Apparatus
Newark 1, New Jersey • Represented in Principal Cities

SA-188